ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 16, No. 8. WEEKLY. | NEW YORK, SATURDAY, APRIL 19, 1890. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

Interesting and Artistic Electric Light Plants.

The day for careless and, consequently, inartistic work in the installing of electric light plants is past. At least, it is past, if it ever existed, in the work of the U. S. Electric Lighting Company. Two Philadelphia plants of this company we illustrate herewith. The Philadelphia office of this company has for several years been in charge of Mr. Chas. A. Bragg, a popular and energetic representative. Mr. Bragg is to be congratulated on the universally tasteful and successful installations his record presents. The plant at the Manufacturers' Club is one that a less sanguine man would never have undertaken to secure, for the president of the club is also the president of the big lighting company of Philadelphia, and he had offered to put in the plant without charge. But the persuasive Bragg, nothing daunted, convinced the committee in charge that the proper thing for them to do was to pay for everything they got—and so they did pay for this extremely handsome electric light plant, and Mr. Bragg's company receipted the bills. Mr. Bragg has now associated with him Mr. George F. Porter, a gentleman widely known to the electrical fraternity, and, together, they make a combination that naturally causes electric lighting contracts to head towards their office in the Girard building, which is also, it is scarcely necessary to remark, lighted by the electric light system espoused by these enterprising gentlemen. They now represent at all hours, day and night, the United States Electric Company, the Westinghouse Company and the Sawyer-Man Electric Company, and manage with ease to keep busy.

The two installations illustrated we describe briefly. The Girard building, situated on Broad and Chestnut streets, Philadelphia, owing to its location and beauty, is the most prominent building in the city. The electric light plant, of which we present a view of the dynamo room, contains many features that are noticeable. After the institution had selected their plant they deemed it advisable to depend upon electricity alone, not having a foot of gas pipe in the building. The plant consists of two 600-light and one 250-light United States dynamos, and by arrangement of the engines and dynamos there is no time when the building is without current. The building is wired for 2,000 lights in the most thorough and substantial manner, the very best insulated water-proof wire being used throughout. The wire is of continuous lengths, thus avoiding joints.

Each floor has a separate circuit, which is controlled by a switch on the switchboard in the dynamo room. Each floor is also controlled by a switchboard on that floor, on which are placed the switches and fuses for the different rooms. The fuses are of uniform size, having a carrying capacity of not over 10 lights each. By this arrangement every room and corridor throughout the building is under absolute control of the engineer. There is not a wire exposed in the building, and yet so complete is the system of wiring that all wires are perfectly accessible.

The switchboard, located in the dynamo room, contains all the switches controlling the different floors, corridors, etc., together with switches controlling the current in the banking department, which in turn controls the time locks of the vaults.

On the switchboard are also placed the proper instruments, and by a very simple arrangement either of the dynamos may be used, or two or three may be thrown in in parallel, thereby giving the building the advantage of the entire capacity of the three dynamos. These changes can be made without the slightest variation in the candle-power of the lights, making it very simple in manipulation, and the least chance for accident. This plant has been a success from the start, and the admiration of all who visit it, and was recently thoroughly gone over by a Review representative. Mr. Kelley, the superintendent, keeps the plant in beautiful condition.

The Manufacturers' Club, Philadelphia, is within itself one of the handsomest clubhouses in the country, and is beautifully adorned with everything modern and in elegant taste. The completeness of everything connected with its construction, electrical and otherwise, strikes every visitor.

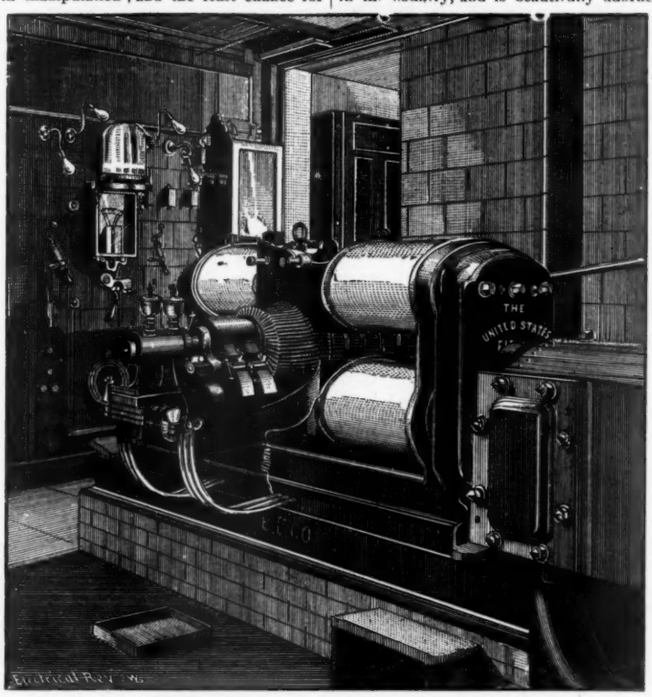


Fig. 2.—Electric Light Plant in Manufacturers' Club, Philadelphia.

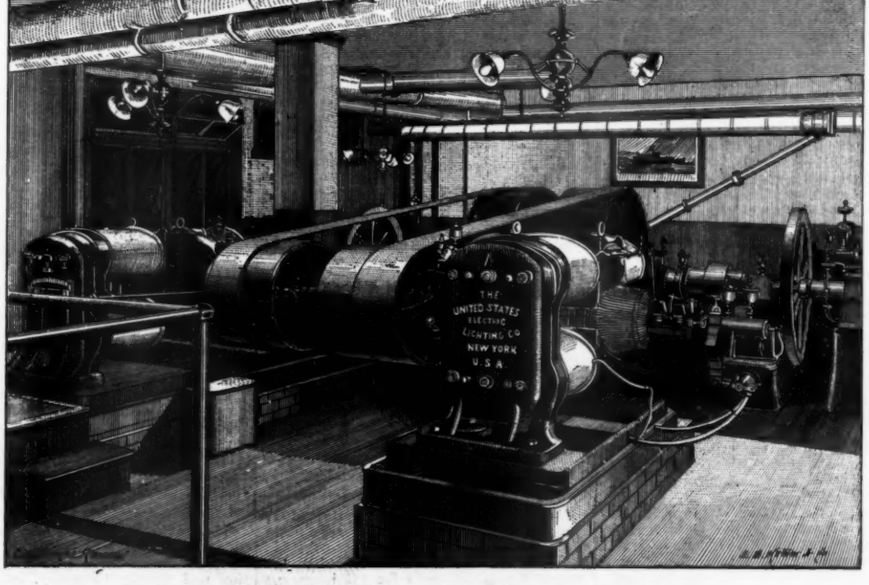


Fig. 1.—Electric Light Plant in Girard Building, Philadelphia.

To "Electrical Review" Advertisers.

As a number of our patrons have informed us that on account of increasing trade they are compelled to secure larger quarters, and will move on May 1st, we intend to make all such announcements in a complimentary "Removal" column, May 3rd. Information of this character must reach us by Saturday, April 26th, in order to insure its publication at that time.

A New Electric Road in the South.

A Northern syndicate has secured control of the electric interests in the towns of Winston and Salem, in North Carolina, and an electric line, connecting the two towns, will soon be installed. The line will be five miles long, and will include six cars. The Sprague system of overhead wiring will be used. The dynamos will be located in the electric light station, which will hereafter supply both light and power for the street cars and general industries along the line.

This is probably the first station in the country from which will be distributed electric power for street railway and general industries and light by both arc lamps and incandescent.

Among the incorporators of the company mentioned are E. H. Johnson, J. H. McClement, F. J. Sprague and E. B. Hawkes.

There are, it is true, a number of cities in the South where there are electric roads in operation, or in process of construction, but the horse and mule are still relied upon in most cities for the operation of street cars. Northern capital, however, is rapidly developing many of the Southern towns, and a few years change a locality from a condition of inertness to one of business and enterprise.

Salem-Winston is a good example of the progressive town of the new South, and shows by its enterprise in electrical enterprises that it is fully awake to the latest of modern improvements.

OUR LONDON LETTER.

The City and Southwark Railway.—The Lord Mayor of London and a number of gentlemen took part the other day in a trial trip on the new underground electric railway which is now fast approaching its completion. The technical press were not on this occasion invited, but it has been announced that an inspection will shortly be afforded. In the trip under notice, of which a very complete account was published in the London *New York Herald*, the plant employed as well as the cars were merely temporary. The cars are somewhat similar to our ordinary tramcars but have better appointments and the roofs form a semi-circle. The locomotive is 100 horse-power and current is supplied at 450 volts; all the lighting arrangements, both in the stations and in the trains, will be electrical. The cars are to be run on the Pullman system and there is a rumor that there will be no distinction of classes, uniform fares for several distances, and that fares will be collected *en route* instead of taking tickets beforehand. The trial trip, owing to the bursting of the water company's pipe near the engine room, necessitating an hour's delay at the Elephant and Castle, was not of as successful a character as it ought to have been, but the great boon to South London travelers was clearly demonstrated and also the great achievement carried out by Messrs Mather & Platt in electric traction. The trains are to be fitted with the Westinghouse automatic brake, workable from the locomotive, which will be supplied with sufficient compressed air for 50 stoppages and can then be replenished at the main stations. The weight of each engine will be about ten tons, the motor being of the Edison-Hopkinson type, and current will be taken from a conductor carried on the wood sleepers between the rails of the line. A few days since Sir Edward Watkyn and other members of the Metropolitan Railway, visited the company's works and expressed themselves very pleased with the working of the electric locomotive.

An Underground Tunnel at Blackwall.—Lord Rosebery has advised the London county council to invite tenders for an experimental shaft and a section of a tunnel, total cost not to exceed £5,000, to try the practicability of an iron-bound tunnel under the Thames, similar to that of the London & Southwark Railway Company.

A Solution of the Difficulty as to Tramway Mechanical Power.—Mr. S. J. Wilde, the chairman of the South London Tramways Company, at the general meeting last week called attention to the rapid strides made by electric traction in this country, and gave as his opinion that the eventual result must be the general adoption of electricity as a motive power.

Engineering and Electrical Exhibition at the Agricultural Hall.—An exhibition of the apparatus employed by engineers, electricians, ironmongers and builders, was opened on Monday last at Islington, and will remain until the 29th inst. There are few electrical exhibits, and these on the opening day were far from being complete, so I must defer any description until I have had a better chance of viewing. Exhibitions have of late been a very played-out subject, but one so general in character as the present, and running for so short a time, ought to be fairly successful.

Messrs. J. B. Verity & Sons' Smoking Concert.—The cricket and football club in connection with this firm gave its third annual concert last Friday week at the Horse Shoe Hotel, Mr. J. B. Verity being in the chair. The result was a great success, about 250 persons being present. The club, which has its own band, gave some selections, Mr. George Verity played the 'cello and Mr. Lovett King and Mr. F. Hill sang, each item being received with the heartiest applause, and encores being plentiful.

An Electrical Scholarship.—Sir David Salomons has made an offer of £1,000 to found a scholarship of £35 a year, tenable for three years, and to be under the disposal of the Institution of Electrical Engineers. The council has accepted with gratitude the munificent offer, and have appointed a committee to confer with Sir David and to settle the details.

The Lighting of the Inner Temple.—The big scheme having proved abortive, a modified arrangement has now been arrived at for the lighting of the public offices and to supplement the existing gas engine plant by the addition of a 20 horse-power nominal boiler and a Williams engine coupled direct to a slow speed dynamo. Messrs. Drake & Gorham were given the order, which has been completed under Mr. W. H. Preece's superintendence as consulting engineer to the Inner Temple.

The Acme Electrical Works.—For the electric light extension of the General Post Office, an order has been secured by this firm for the main and branch distributing switch and fuse boards, and also for Cockburn's patent fuse boxes and fuses.

Death of Mr. W. H. Snell, the Editor of "Electrician."—Our esteemed contemporary has sustained an irreparable loss by the untimely death of their editor on the 5th of March, at the early age of 31. Though so young, his great talents were fully acknowledged by his contemporaries, and it was fittingly and most truly said by Professor Crooks, in moving a vote of condolence at the Institution of Electrical Engineers: "He was popular with all who knew him. He held his most responsible position for the last two years, and there is no doubt overwork and anxiety together have tended to this untimely result. In offering sincere sympathy to those he leaves behind him, a chief consolation must be that his life was laid down on the altar of duty."

Messrs. J. G. Statten & Company, West Drayton.—I am told that Mr. J. G. Moon has accepted the position of manager to the works of the above firm. Mr. Moon lately resigned a similar position with Messrs. J. H. Holmes & Company, of Newcastle-on-Tyne, electric light engineers, and was presented by the firm's employés, as a mark of esteem and regret, with a very handsome ormolu clock and vases.

Aberdeen and London New Telegraph Wire.—The erection of a new wire has just been sanctioned by the post office authorities. There are now two duplex Wheatstone circuits for private messages and two wires exclusively for news transmission. The new wire is for private messages and will also be fitted up as a duplex Wheatstone circuit.

Gulcher (New) Electric Light and Power Company, Limited.—Mr. G. Benswauger announces he has resigned his seat on this company's board. He reminds the shareholders he was elected to represent the interests of the creditors of the old company and who took shares in the new company for their claims, and that the issue of the remaining shares now being successfully accomplished, he considers he has carried out his task. A new issue of shares was made last week and as the business is in a sound condition and rapidly increasing, the plant and machinery first class, and the officers and workmen skilled and experienced, the company seems assured of a bright future. The dynamos and other manufactures of this company are among the few that have been accepted by the British admiralty authorities.

Electric Lighting Contretemps in Paris.—A few days since, owing to the extinction of the Popp regulators, a portion of the Grande Boulevards, between the Place de l' Opera and Place de la Madeleine, was plunged into darkness.

Cologne.—A central station on the alternating current system is to be established at Cologne, and a sum of 1,850,000 marks has been voted for the purpose. The price has been fixed at 1*d.* per 100 watt hours.

London, April 2. CHARLES FFRENCH.

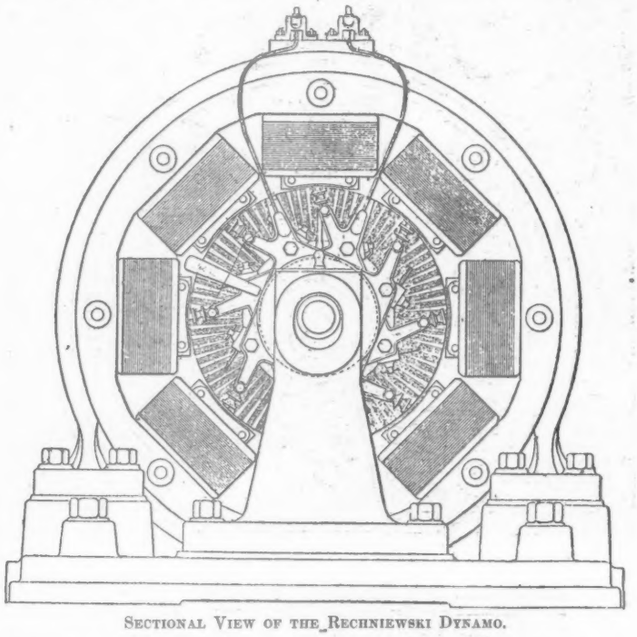
Bids for Electric Lighting in New York.

The new bids of the electric lighting companies for lighting the city of New York, are about 20 per cent. higher than last year. This is accounted for by the fact that subway service is very costly. The United States Company wants from 39 to 42 cents a night for 314 lamps. The Brush Company bid the same for 337 lamps. The bid of the Mount Morris Company for 175 lamps ran from 39 to 42 cents; the Harlem Company, 185 lamps, 39 and 50 cents, according to location, and the East River Company, 226 lamps, 42½ cents. The bids have been referred for tabulation and report.

The Rechniewski Dynamo.

Our illustration shows a multipolar machine of the Rechniewski type, for which we are indebted to the London *Electrical Engineer*.

Are the field magnets laminated? is, by no means, an infrequent question when talking about dynamos. M. Rechniewski believes in a thorough lamination of his pole pieces, and so would a good many constructors if they could overcome the prejudice against increased cost of construction. A machine, and especially a dynamo, is and must be a compromise between theory and practical construction. A more perfect machine may be designed, but it will not pay to produce it, and to such a perfection is the "efficiency" of the machine carried by the best constructors, that the question of "more in accord with theory" is met with the reply, "it won't pay." Rechniewski uses laminated field magnet cores instead of solid cast or wrought iron cores. The armature is practically a Siemens armature. The *Société l'Eclairage Electrique* constructs these machines in various standard types, to give from 150 to 120,000 watts. The output, per weight, is one horse-power for from 55 lbs. to 65 lbs., according to the size. The efficiency claimed is from 88 to 95 per cent., and the question is whether this efficiency is greater than that of non-laminated machines—in fact, enough greater to warrant the extra cost in building, as the sheets have to be insulated and the whole connected.



SECTIONAL VIEW OF THE RECHNIEWSKI DYNAMO.

The New York Subways.

The Board of Electrical Control last week rescinded its resolution directing a contract to build subways with the Standard Electrical Subway Company, on motion of Mayor Grant.

The board further directed the old Consolidated Subway Company to build all of the subways ordered and to begin work at once.

The board had been enjoined by the Supreme Court from making a contract with the Standard Company, but the order was settled so that a modified contract might have been entered into.

Edward Lauterbach, of the Consolidated Company, announced that it was ready to do all the work required of it.

A resolution was passed directing the old Subway Company to build all the subways which it is intended to build; its first efforts being directed to the streets which Commissioner of Public Works Gilroy is repaving.

The invitation to an informal annual dinner to be given at the Hotel Ryan, St. Paul, by the Northwest Electric Construction and Supply Company, has been received at the REVIEW office. It is a pretty long trip from New York to St. Paul, but we regret we can't be there, for the dinner is sure to be one of the best and the occasion a particularly agreeable on.

Precious Platinum.

INTERESTING FACTS ABOUT A VERY USEFUL METAL.

"Look at this," said a Newark jeweler to a reporter of that city, exhibiting a piece of metal about three inches in length by one in width, and one-quarter of an inch thick, having, to the inexperienced eye, the appearance of block tin. "That is platinum, and it is worth about $150." It was an insignificant looking slug, but its weight was impressive and commanded respect, inasmuch as it was heavier than that of a piece of gold of the same size.

Platinum is just now an extremely interesting metal, because its price is steadily climbing toward the gold standard. Platinum ore, denominated in mineralogy, "native platina," occurs in very small, irregularly formed particles (the weight of the pieces rarely exceeding a few grains) of uneven surface, and in color a steel gray. Refined platinum has somewhat the appearance of silver, though less bright, but it possesses the merit, which silver has not, of never tarnishing. When first discovered, the idea was entertained of its being related to silver, hence its name, derived from the Spanish words *plata-neta* (little silver). Discovered first in Peru, and subsequently in other parts of South America, it has also been found in North America, in North Carolina and California, but not in sufficient quantities to make the labor of securing it remunerative. From 50 to 250 ounces of platinum come from the placer gold mines of Montana and Oregon every year, but this quantity is insignificant in comparison with the amount consumed in this country, which last year was in excess of 5,000 pounds, and is increasing at the rate of 1,000 pounds a year.

At present the markets of the world depend for their supply on Siberia, where the ore is found in large quantities in the gold-bearing sands of Kuschwa, in the Ural Mountains. In weight it is the heaviest of all metals, its specific gravity, when refined, being 19.50, while that of fine gold is 19.26. It is very ductile and malleable. Platinum has proved itself a metal of great utility, its uses in chemistry being numerous and important. In Russia, about the year 1840, it was coined, and formed a part of the circulating medium of that country. Notwithstanding its many uses, however, its value until within a few years had not exceeded seven dollars per ounce, or about one-third the value of pure gold. In 1880 the supply was more than equal to the demand at six dollars; at the present time the demand is from 25 to 50 per cent. in excess of the supply and the price has advanced beyond $12.

The causes of the increased consumption are to be found in the constantly increasing demands of the electric light companies for platinum wire for use in the manufacture of incandescent lamps. Judging from present indications, it would seem that the production of these lamps is likely to be retarded, it being almost impossible to place an order for either the ore or the metal in any mart at the stipulated price. The question of price, however, does not trouble the electric light people; it is the question of being able to get the metal at any price that is causing anxiety. One company that endeavored, a few days ago, to place an order of several hundred ounces at an advance on the highest price quoted, failed simply because there was not that amount of material available in the home market.

Platinum is admitted to the United States free of duty, but it is subject to an export duty of three per cent. The Russian government will unquestionably increase that duty possibly to 33⅓ per cent., the matter being under present advisement. Should such be the decision of Russia, it is probable that platinum may, in the near future, become more valuable than gold. The metal is an absolute necessity to makers of incandescent lamps, because of one of its peculiarities, which is not possessed by other metals in the same degree. Its expansion under changes of temperature is so slight as to admit of it being sealed in glass, so

that a vacuum can be preserved in the little globes and still give electric connection with the outer air. Each lamp bulb contains in its stem about one and one-half inches of thin platinum wire, which is connected by electroplating, or by minute bolts and nuts, with the carbon filament in the lamp, and with thin copper wires beyond the seal in the stem of the bulb.

A few years ago the United States was dependent upon European manufacturers for metallic platinum, but now there are several refiners in this country, the establishment of Baker & Company, Newark, being the largest. This company supplies all the jewelry shops of Newark and many of the electric lamp companies and manufacturers of electrical instruments of this country. Nearly all electrical appliances use platinum wire or sheet platinum for contact points because the metal does not oxidize under the electric spark. Every bell, every telegraph instrument and all medical coils have their platinum points, and while the quantity of platinum in each instrument is small, the aggregate is enormous, and the demand for the metal is constantly increasing. The total output of the Russian mines has never exceeded 50,000 pounds a year, and unless means are found for profitably working American mines, the price of the metal is bound to increase steadily.

JEST FOR FUN.

There is to be a fast telegraphing contest. The contestants are fellows with wiry arms. —*N. Y. World.*

"No need of 'Dutch courage' by the glass any more," said Shorty, "now that we have the telephone."

"Why not?"

"Oh, I just called a six-foot heavy-weight a rascal and a humbug over the 'phone, knowing he was a mile away."—*Chatter.*

An Indian waited for a train at a Northern Pacific station, in Idaho, and while there saw the agent talking into a telephone box.

"Umph," said the Indian, "Who you talk to?"

"I'm talking to a man," said the agent.

"Heap little man if him live in there," said the buck.—*Chatter.*

Many primary batteries are a big cell.

"Telephone girls come as near being angels as any one on this earth."

"How's that?"

"Their heads are always surrounded by a 'hello.'"

"Why do you call your little dog 'Field?'"

"Because he is easily excited."

Noah can claim precedent as an electrical inventor. When he sent the animals ashore on Mt. Ararat he made the ark light.

Dynamos Replace Batteries.

Last week the Postal Telegraph Company put into operation its new dynamo system in Pittsburgh. There are 12 dynamos altogether, and two seven horse power engines to drive them, one of the engines being reserved in case of accidents.

The dynamos will replace 4,500 jars, and besides will have 10 times the strength, and will cost about half as much per year to maintain as the jars. To keep up each jar requires the expenditure of $1.10 yearly, or $5,000 for the 4,500, but the dynamos will be a great saving. They are of the F. W. Jones' patent, and made by the Westinghouse people. In replacing the old system the company had to put in new switchboards, and to make all the connections in the office required 3,000 miles of wire. A new wire even had to be laid to each operator's desk. It cost about $5,000 to put in the new system.

The jars will be removed and sent out to country offices where it will not pay to locate a dynamo. Pittsburgh is a sort of half-way station of the Postal Telegraph, and for this reason is one of their most important points.

Comparative Figures.

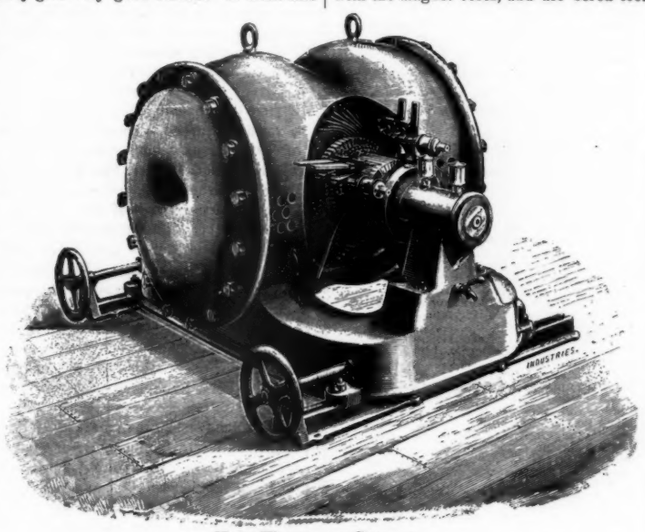
Sound travels about 1,093 feet per second, a rifle ball flies 1,460 feet in the same time, light moves 192,000 miles per second, while electricity makes 288,000 miles per second.

Improved Wenstrom Dynamo.

We illustrate herewith a Wenstrom dynamo of the latest type, recently described in London *Industries*. Its output is 110 volts and 180 amperes at 500 revolutions per minute. Its weight is 1,800 kilogrammes, or under two tons. It has four poles, with the armature conductors in series parallel.

Mr. Wenstrom was the first, or, at least, one of the first, to imbed the armature conductors in the iron of the armature. He has apparently arranged the field magnets on the ironclad principle.

These machines have been very thoroughly tested at the Johns Hopkins University. They give very good results. It must also be remembered that the method of winding the armature conductors admits of great mechanical strength and durability. These machines are made by the Wenstrom Southern Electric Manufacturing Company, Baltimore.

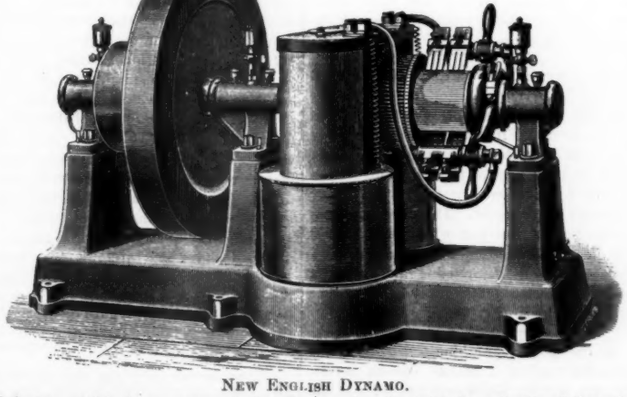


NEW WENSTROM DYNAMO.

An Improved English Dynamo.

The illustration represents one of Messrs. Charlesworth, Hall & Company's dynamos, which has been specially designed for driving from a gas engine. These machines are carefully designed mechanically as well as electrically, and the lubricating arrangements are very convenient and perfect. Each bearing is fitted with a special sight-feed lubricator, which is so arranged that the feed, when once adjusted, can be turned on or off without fresh adjustment, and can be increased or decreased at any time when found necessary. Each bearing is also fitted with two simple siphon lubricators, which are intended to be used if any of the bearings should become heated. The waste oil from the bearings is caught in the enlarged ends of the pedestals and runs from these into the insides of the pedestals and down into the standards carrying them, and can be drawn out as required. These arrangements keep the machine entirely free from oil except where it is required. The bedplate has been extended to support the extra weight of the fly wheel, which is 30 inches diameter and weighs about 600 lbs. After being turned all over, this has a wrought hoop, previously bored, shrunk on and then turned up. The shaft is of hard steel, and is 2 inches diameter in the bearings at the pulley end, and 1⅞ inches at the other end. The bearings are of aluminium bronze, each 8 inches long. The pulley is 13 inches diameter, and carries an 8-inch belt. The bed-plate is of massive construction and well ribbed to withstand rough usage in transit and fixing.

The magnet cores are of soft charcoal iron, fitted into holes bored through the bed-plate, and secured in their places by screws. The pole pieces are in one forging with the magnet cores, and are bored from the pedestals to receive the armature, which is placed exactly in the center. The armature frame is of strong aluminium brass, and the core, which is 12 inches diameter, is built up of soft charcoal iron disks insulated from each other, and has an area of 40.5 square inches. The commutator brush is a steel casting with wrought iron nut and washer, and is 6½ inches diameter; it has 80 hard drawn copper bars, 1 inch deep, and is insulated entirely with mica. The armature is wound with 200 convolutions of one No. 8 B. W. G., and has a resistance of .045 ohm. The magnet is shunt wound only (for charging accumulators), and each leg is wound with 10 layers of No. 14s and 16 layers of No. 15s, and has a total resistance of 31.6 ohms. There are two brushes on each side of the commutator, each of which can be adjusted independently of the other. These machines work without any sparking with the full load; when working lamps the normal load is 150 amperes and 100 volts at 670 revolutions per minute, and 150 amperes and 140 volts at 820 revolutions when charging accumulators.



NEW ENGLISH DYNAMO.

The electrical efficiency when working lamps as above is given by our esteemed contemporary, *Industries*, as follows:

Loss in armature ..... 6.2 p. c.
" magnet ..... 1.94 p. c.
Total loss....8.14 p. c.—*i. e.*, 91.86 p. c. efficiency.

or when charging accumulators with 140 volts:

Loss in armature = ... 4.474 p. c
" magnet = ... 2.741 p. c
Total loss = 7.215 p. c.—*i. e.*, 92.785 p. c. efficiency.

The above machines are 5 feet long and 2 feet 8 inches wide, and 3 feet 6 inches high over all.

Memphis, Tenn. — Memphis Light and Power Company.

Columbus, O.—The De Sant Electric Company; capital stock, $50,000.

Youngstown, O.—Youngstown Electric Light Company; capital $75,000.

Darby, Pa.—Home Electric Light and Power Company; capital $2,500.

Lansdowne, Pa.—People's Electric Light and Power Company; capital $2,000.

Wichita, Kan.—The Wichita Union Telegraph Company; capital stock, $100,000.

Clifton Heights, Pa.—Citizens' Electric Light and Power Company; capital $25,000.

Little Rock, Ark.—The Capital Street Railway Company. The capital stock is $300,000.

Des Moines, Ia.—The What Cheer Electric Light and Power Company; capital stock, $20,000.

Fairmont, W. Va.—The Fairmont Electric Light and Power Company has been chartered, with a capital stock of $5,000.

Oakland, Cal. — Oakland Electric Construction Company. Directors: Thomas Trebell, J. J. Scoville, A. Humphrey, W. B. Reynolds, J. H. Smith.

Milwaukee, Wis.—The Milwaukee Light and Power Company; incorporated by J. J. Kempf, W. H. Earles and Chas. Stolpher, with a capital stock of $500,000, divided into 20,000 shares.

Portland, Me.—The Electric Generator Company has been organized with a capital stock of $1,000,000; par value shares, 100. President, E. H. Hyde, Jr., Hartford, Ct.; treasurer, Ernest Cady, Hartford, Ct.

Arkansas City, Kan.—The National Electric Light and Power Company; capital stock, $50,000. Directors: W. A. Thomas and J. F. Saunders, of Guthrie, Oklahoma, and M. F. Bailey, Charles Hutchins and E. L. McDowell, of Arkansas City.

Kansas City, Mo.—The Kansas City Fire and Burglar Alarm Company; capital stock, $15,000. Directors: Alfred H. Cobb, Henry McGrew, Edmond R. Wilder, Hector Lithgood and E. F. Mully, of Kansas City, and Wm. H. Brown, of Leavenworth.

Newport, Ky.—National Electric Car Company; capital stock, $1,000,000, divided into shares of $25 each. The incorporators are Albert G. Clark, C. Bentley Matthews, Peter G. Thomson, Ellis M. Potter, Andrew J. Parlin and Benjamin F. Ehrman.

Norwood, N. Y.—Norwood Electric Company, with a capital of $10,000. The trustees are George W. Richards, Sidney R. Phelps, William D. Fuller, Fred. R. Smith, Loring R. Ashley, Thomas C. Frenyear, Norman M. Claflin, E. F. Hall and George Harris.

Union, Ore.—Union Electric Power and Light Company; capital stock, $100,000, divided into 200 shares of $500 each; incorporators, J. Hutchinson, W. R. Hutchinson, J. W. Shelton and R. W. Purdom; purpose, to do a general electrical business in all its branches.

Minneapolis, Minn. — The Carpenter-Nevens Electric Heating Company; with a capital stock of $300,000. The highest amount of indebtedness, at any one time, is limited to $10,000. The incorporators are F. W. Nevens, Charles G. Carpenter, M. F. Schofield, John W. Kelly, L. Kimbell and Robert T. Lang, of Minneapolis.

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
"546 JOHN," TELEPHONE CALL.

BOSTON OFFICE:
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WASHINGTON OFFICE:
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CHICAGO OFFICE:
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EUROPEAN OFFICE:
CHARLES FFRENCH, Bridge House, 181 Queen Victoria St., London, E. C.

SUBSCRIPTION TO THE ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy. - - - - .10

ANNOUNCEMENT.

Address all communications and make all money orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

No attention will be paid to communications for the REVIEW without the *name and address of the writer.*

NEW YORK, APRIL 19, 1890.

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In our editorial in last week's issue, entitled "Cheating the Dynamo," which has been extensively quoted, one important assertion, that a current of electricity which might be taken with impunity by one person would be more than enough to kill another, has been corroborated by two English scientists, whose work is referred to in another column.

Mr. Henry M. Stanley, in an interview with a New York *Herald* correspondent, said that the Aruwimi forest, which belongs to the Congo Free State, was enormously richer in everything, especially in rubber trees, than the Amazon forests. This section of Africa, he declared, would be the rubber reservoir of the world. This is certainly encouraging for American wire manufacturers who use rubber in their insulation. Such a statement from so reliable an authority ought to have a salutary effect on the market price of rubber.

In the fast telegraphing tournament, the splendid sending of Messrs. Gibson, Ayres, Waugh, Catlin, Bradt and others, was the occasion of much favorable comment from the "old-timers" and others. To an outsider there seems to be nothing marvelous in an operator sitting at a table and clicking away at a key, but when it is considered that the feat is performed before an hypercritical audience who are thoroughly familiar with every move, that the operator is struggling for a prize, and that if he is the least bit embarrassed or nervous, his hands will undoubtedly tremble, thus destroying his chances, the true difficulties of good and rapid sending become apparent. The ladies who took part in the tournament are to be especially commended for the calm and business-like way in which they did their work.

The "raw-boned youth from the country" has again become famous. He came up from "daown Hartford way," and calmly raked in the first prize at the fast telegraphing tournament. The REVIEW congratulates Mr. Pollock.

Professor Cyrus F. Brackett, in his opening address, at the Lenox Lyceum Exhibition, made use of this expression: "Sound is not air; it is air in motion. Electricity is not matter, it is matter doing something. And we are all trying to find out just what it is doing." The analogy and the manner of its expression are well-nigh perfect. This is the language which the merest novice can perfectly grasp and digest. Would that we had more such men as Professor Brackett, who can fitly express intricate technical ideas in the language of the people.

That the horse-breeding industry is being seriously disturbed by the rapid development of electricity as a motive power, is evident. The indications now are that within another three years there will not be a horse car in active service in any of the cities in this country. It is estimated that anywhere from 20,000 to 50,000 horses now in use will be thrown upon the market. This possibility has caused a large decrease in the market value of such animals. The advance of electricity will have a beneficial effect in that it will create a demand for higher grade horses at better prices. What will become of the poor car horse remains to be seen.

As we have before remarked, there is a large and increasing demand for good electrical engineers. If a young man, about to enter college, is hesitating as to what course to pursue, our advice is to study electrical engineering and, after graduation, to enter some large electrical company's shops, don blue jeans overalls, and get about two years practical experience. Then we think he is perfectly sure of a good position. Over $80,000,000 new capital has been invested in the electrical industry in this country during the past year, and in England, during one week, 21 electrical companies were organized. This shows how rapidly the industry is growing.

INCREASE THE PATENT OFFICE FACILITIES.

Three millions of dollars is the sum which it is proposed to appropriate for the building of a new Patent Office, or for making some provision for removing the other bureaus of the Interior Department from their present quarters and giving the whole of the building to the Patent Office. Representative Butterworth, chairman of the committee on patents and ex-commissioner, states, in a report to the House, that a suitable building can be constructed by private contractors in one year, but that it would probably take the government from five to ten years to do it and it would cost twice as much. He declares, with much emphasis, that there is neither justification nor excuse for continuing the office in the insufficient, inconvenient and unhealthy quarters which it has so long occupied and which are rapidly becoming more unfit for the purpose. He believes that Congress has dealt with this important bureau in palpable disregard of the rights of the citizens having business to transact before it, and who pay the whole expense of its maintenance.

Inventors not only pay the cost of their own labor and researches in perfecting their inventions, but they also pay the cost of the examination by the government to determine whether the invention is new and useful, and therefore patentable, and, if patentable, they pay the expense of issuing the patent. So that the Patent Office has to its credit $3,631,670.32 over and above all expenses, which the inventors of the country have paid for the support of the bureau, and this surplus should be used in providing proper facilities for the rapidly increasing work.

General Butterworth says that until recently the Patent Office has been regarded by a majority of the people as a clearing-house for cranks, but it has really contributed in a larger measure that any other bureau or department of the government to the development of our industries, and in enabling us to attain our present unequaled prosperity in the field of the industrial arts and sciences.

ALTERNATING AND CONTINUOUS CURRENTS IN RELATION TO THE HUMAN BODY.

In view of the great interest in death by electricity expressed by the public since the passage of the electrocution law, the accompanying information will be pertinent.

Under the above title, Mr. H. Newman Lawrence and Arthur Harries, M. D., recently presented a paper to the British Institution of Electrical Engineers. These gentlemen made a repeated series of experiments with the hope of solving some of the physiological problems which occurred in the course of electro-therapeutic work in which they were engaged at the Institute of Medical Electricity. These experiments differed from those of D'Arsonval and others, in the important point that they dealt, not with the bodies of rabbits, dogs, horses or other animals (from which conclusions regarding human life have to be evolved), but directly with the human body. Small currents at a low E. M. F. were used and the attention of the experimenters was chiefly directed to the determination of the resistance of the human body and skin to the passage of currents under certain conditions (moist and dry), and a comparison of the sensations produced in the human body by the passage of the two forms of current. At the start it was assumed that what is true of small currents at low potentials may fairly be taken to be intensified as the current strength and E. M. F. increase.

After performing their experiments and tabulating the results, the situation is summed up as follows:

"What the minimum current of either kind which will destroy human life may be, we are not in a position to say; though D'Arsonval, in his report on electro-physiology, made before the International Congress of Electricians, held at Paris, 1889, says, referring to his experiments on rabbits, guinea pigs and dogs: 'With a machine of 8,000 volts a momentary closing of the circuit caused the animal (a rabbit) to make a prodigious leap, but did not cause death immediately; a second application was necessary.

"'An alternating Gramme machine only causes death above 120 volts mean potential.'

"These statements are not very clear, but we gather therefrom that while a continuous current machine having an E. M. F. of 8,000 volts did *not* instantly kill a rabbit, yet an alternating current machine having a mean potential of 120 volts, did. We feel sure that no hard-and-fast lines can be laid down on the subject. *Individual resistance and individual sensitiveness vary so much and so unexpectedly, that a current which might be taken with impunity by one person, might be more than enough to kill another.*

"Independently of the kind of current used, the character of the contact made, the surface area of the body involved, and the suddenness of closing or opening the circuit, must each and all play an important part in the result.

"Shock varies with the form of current employed; thus, with continuous current, only a 'make' initial shock is possible, while with alternating currents the initial shock may be either a 'make' or a 'break' shock.

"As 'break' shock is admitted to be the more marked of the two, independently of the steady diminution of resistance to alternating current, it is probable that the effects of an initial shock with alternating currents of similar strength may be more disastrous than that with continuous current."

An English photographer claims to have obtained a photograph in which the natural colors were reproduced when the exposure was made, by accident, just at the moment when there came a blinding flash of lightning. He says that a friend of his once got a colored plate under similar circumstances, and believes that electricity has to do with photographing colors.

No one who has ever ridden on the electric cars in Boston, after they leave the city proper, has any doubt of the ability of the electric car to successfully cope with the rapid transit problem. It is only when hampered by aldermanic restrictions, narrow streets and overcrowded thoroughfares, that the electric car ceases to fulfil its mission. Give it the chance it deserves, and no quicker or better means of transportation could be desired. It looks now as if Boston will have to come to elevated roads upon which the electric cars can run swiftly and freely.

CORRESPONDENCE.

Electrical Happenings in Washington, Boston and Elsewhere.

OUR WASHINGTON LETTER.

The New Arc Light Plant installed in the Washington Navy Yard by the Brush Electric Company was put in operation on the 10th inst. and proved very satisfactory to officers of the department. About 100 lamps are now in use and it is expected that the number will be considerably increased. In some of the gun shops it is found that work can be done better by the electric light than by sunlight. The construction of the plant is of a very superior character, many useful improvements having been introduced.

Personal.—Lieut. Bradley A. Fiske, of the Navy, has been assigned to duty at Cramps' Navy Yard, as superintendent of the electric plants now being installed in the new war ships at that place.—Lieut. J. H. Glennan, U. S. N., who has been stationed at the San Francisco Navy Yard for some time, in charge of the electric work on the new cruiser "Charleston," has gone to sea in that vessel. He is the electrical engineer of the ship.

The Navy Department has issued specifications for electric lighting plants for five new cruisers, but as these are parts of the general specifications for the construction of the vessels, which will be several years in building, there will be time for numerous consolidations of electrical corporations before bids need be sent in.

A Proposed Railway, to be operated by cable, electric, pneumatic or other mechanical power (except the use of steam locomotives), is the City and Suburban Railway Company, of the District of Columbia; capital, $1,000,000; William S. Thompson and John A. Baker, of Washington, principal incorporators. Another new project is for the organization of the Tenleytown and Rockville Electric Railroad Company; address, Rockville, Md.

Some Person, evidently with more enterprise than prospect of success, has had a bill introduced in the United States Senate directing the District Commissioners to assume control of the Washington Gas Works and undertake the lighting of all public and private places in the city, either by gas or electricity, as they may deem best.

Electric Boot Blacking.—Mr. C. W. Messner has added the blacking of boots to his other electrical industries. A round brush attached to the end of a flexible shaft, revolved by a small electric motor, does the work, while the customer sits in an easy chair at the street corner. The establishment brings a rental of $10 a month, and the lessee drives a sharp competition with the old-fashioned "shiners."

Mr. C. M. McNett, the well-known representative of the Thomson-Houston Electric Company, died in this city on Friday afternoon. He had suffered from consumption for several years, but with remarkable determination and energy, kept at work as long as he was able to be out of bed. A year ago he spent several months in California, hoping to regain his health, but the Pacific climate did not prove beneficial. Since Capt. Clark has been acting as the Washington representative of the Thomson-Houston Company, he has had the advice and counsel of Mr. McNett, which have aided him in advancing the interests of the company. The officers of the company have shown him especial attention during his illness, and in many delicate, kindly ways, have brightened and cheered his last days. He leaves a wife and three small children who, as a result of his successful business enterprise, will be financially provided for.

Washington, D. C., April 12. G. C. M.

OUR BOSTON LETTER.

New Regulator.—Mr. Henry W. Cooley, of this city, has secured a patent for a new type of dynamo regulator.

Mr. David E. Evans, of Baltimore, superintendent of the Baxter Electric Motor Company, was in Boston for several days this week.

Erie Telephone stock had quite a boom early in the present week. On Tuesday last shares sold at $41, the highest point reached since 1884.

Mr. Fred. E. Pettingell, senior member of the firm of Pettingell, Andrews & Company, of this city, returned from his European trip on Monday, and was welcomed by many friends.

Water Power for Electricity.—Arrangements have been completed for supplying the Hartford, Conn., electric light stations with water power from the Farmington River. The power station is to be located near Tariffville, Conn.

William H. Baker, of New York, has been appointed permanent receiver of the Commercial Telegram Company, in the sequestration proceedings brought by John W. Mackay on his judgment of $287,312.

The U. S. Electric Safety Company, of New York, has established a branch department in this city with offices at No. 146 Franklin street. Messrs. Loren N. Downs and E. E. Zimmerman, of the company, are in Boston, inaugurating the new department.

Lecture on Alternating Currents.—Thursday evening, April 10. At the regular weekly meeting of the Society of Arts, at the Massachusetts Institute of Technology, Prof. Elihu Thomson read a paper on "Alternating Currents."

Mr. C. L. Edgar, manager of the Edison Electric Illuminating Company's interests in this city, has returned from an extensive tour abroad. While in France and Germany, Mr. Edgar visited and inspected several electric light stations, and states that he "was particularly well pleased with the arrangements and equipment of the Berlin station."

Boston Electric Club.—The house and entertainment committee is making arrangements to have the much talked of ladies' reception take place at the Club rooms on Wednesday evening, April 23. It is proposed to have several interesting exhibits at the reception, including phonographs, an electric piano, Edison talking dolls, etc.

The Mason Regulator Company, of this city, is reaping the benefits of a large and satisfactory business among electric light stations in various sections of the country, particularly in New England. It is stated on reliable authority that the Mason reducing valve has been adopted by the Thomson Electric Welding Company and is being sent out with welding machines.

Standard Electric Company, of Vermont, report recent installations of its system as follows: 200-light incandescent machine at the palatial residence of Mr. C. J. Bush, at Brooklyn, Conn.; 100-light incandescent machine at the factory of the Fibrewood Company, Plymouth, N. H.; and an increase from 300 to 1,200 incandescent lights at the manufactory of Messrs. Prouty & Company, Spencer, Mass.

The Aluminum Metal Manufacturing Company is the name of a new concern recently organized in this city. The company have, it is said, a large financial backing, and will soon commence the manufacturing of aluminum flux, a purifier and strengthener of copper, iron, steel and other metals. It is claimed that "by a combination of aluminum flux and iron a casting is produced which is free from blow holes and other imperfections common to ordinary castings." An amount of flux from one-half to one per cent. only is required to effect the above results. It is also claimed that, "as an admixture with copper, a gain of tensile strength of at least 50 per cent. is obtained by the addition of only one per cent. of the flux, the metal casting perfectly solid and free from air-holes."

British Cable Steamer "Minia," belonging to the Direct Cable Company, arrived off Portsmouth, N. H., last week for the purpose of repairing the cable at Rye Beach, which had become badly chafed on the ledges near there. Recent advices state that "the cable had been fished up 1¼ miles from shore and the injury located, but—by reason of heavy weather prevailing at the time—the work had to be abandoned before the repairs could be finished."

The Spencer Damper Regulator.—Mr. G. G. Stillman, of this city is the manufacturer's agent for this popular regulator. The following named electric light stations recently adopted this well-known apparatus: Edison Electric Illuminating Company, Brooklyn, N. Y.; Nantucket (Mass.) Electric Light Company; East Greenwich (R. I.) Electric Light Company; United Electric Light Company, Springfield, Mass.; Cambridge (Mass.) Electric Light Company, second order; Eastport (Me.) Electric Light Company; Putnam (Conn.) Electric Light Company; Dedham (Mass.) Electric Light Company, and Seneca Falls (N. Y.) Electric Light Company.

Electric Stocks.—Boston quotations at closing hour of the Exchange, Saturday, April 12, were as follow:

Thomson-Houston Electric Company	58¾.
" " " " Preferred.	96.
" " " " Series C..	16¼.
" " " " Series D .	7⅝.
Thomson Electric Welding Co	335.
" European Welding Co	113.
Westinghouse Electric Co	45.
Fort Wayne Electric Co	15.
Edison Phonograph Doll Co	7¼.
TELEPHONE:	
American Bell	214.
Erie	40.
New England	49.
Mexican	1.05
Tropical American	.75
National Tel. Mfg. Co. (acoustic)	.65

Boston, April 12, 1890. W. I B.

SOUTHERN ELECTRICAL NEWS.

Augusta, Ga.—The Augusta and Summerville Railway Company, four miles in length, is to be equipped with the Thomson-Houston electric cars, work to be completed June 1st.

General Notes.—The Fulton County Street Railway, of Atlanta, have increased their rolling stock four motor cars.—St. Simon's Hotel, St. Simon's Island, Ga., is to be equipped with 100 incandescent lights, Thomson-Houston system.—Columbus, Ga., has increased their arc lighting plant, 50 lights.—Chattanooga, Tenn., has closed a contract with the Thomson-Houston Company for a 1,300 light alternating machine.—Memphis, Tenn., is to be supplied with two 1,300 light alternating machines, 250 arc lights, Thomson-Houston system.

Memphis, Tenn.—The City and Suburban Street Railway Company, five miles in length, is to be equipped with motor cars, Thomson-Houston system. The road is to be in operation June 1st.

Personal.—Mr. W. H. M. Weaver, late of Americus, Ga., has been appointed manager of the telephone exchange of Anniston, Ala.—Mr. Earnest Shepherd, late of Columbus, Ga., has been appointed manager of the telephone exchange in Americus.—Mr. W. T. Gentry, manager of the telephone exchange in Atlanta, has recently returned from a trip to New York.—Mr. H. A. Pevear, president of the Thomson-Houston Company, is in Atlanta. F. E. C.

Atlanta, Ga., March 29.

A New and Important Electrical Organization.

The National Electrical Manufacturing Company has been formed, and succeeds the electrical department of the New Haven Clock Company. Mr. J. G. Noyes, who has so successfully managed the electrical department in the past, is general manager of the new company, which is backed by a number of influential and wealthy men of New York, and possesses a large paid-in capital. The new company will succeed to all the interests that the New Haven Clock Company had in their electrical department, and will also have the right to use any of the clock machinery that may be needed in getting out the new company's products.

All grades of insulated wire will be manufactured by the new company, which will be ready to open up for business in a few days. The control of the Microphone battery, the Crowdus dry battery, the Walker electric messenger call and numerous other patented devices, heretofore controlled by the Clock Company, have become the property of the National Electrical Manufacturing Co.

This new organization may be expected to keep in the front ranks of electrical progress under the able management of Mr. J. G. Noyes, whose work in the past has been so successful and progressive.

The Phonograph Sale Suit.

Judge Wallace, in the United States Circuit Court, rendered a decision Thursday of last week, in the case of Edison *vs.* Gilliland and Tomlinson, in regard to the sale of the phonograph to Lippincott. The judge decides in favor of the defendants, sustaining their demurrer to the amended bill of complaint, and states that the case is to be considered as one between principal and representatives and that the "facts alleged show that the sale has never been completed, and consequently the plaintiff has lost nothing by the transaction."

"Think it Over."

We have received a circular setting forth the alleged merits of a primary battery made by a self styled inventor, now working Chicago.

"Let me give you a pointer!" says the manager, in his circular, "It is an open and acknowledged fact that none of the dynamo companies have been able to furnish a satisfactory light or return dividends on the money invested."

That's all. Now that he has disposed of the nice, big electric companies at a single swat, he proceeds to tell you that the primary battery for economical electric lighting and power has come to stay. How long? Just as long as Thompson, the fool-killer, neglects his duty.

"Now, a word or two regarding the stock as an investment.

"A central station plant, such as we are erecting at the ——— House, will cost $7,000. It will furnish 1,000 lights. Each light will displace three gas jets or four dynamo incandescent lamps, and as we furnish the light at gas rates, each lamp, at the lowest calculation, will surely net our company 50 cents per week, which amounts to $500 per week, or an annual net income of $26,000. Suppose, at the end of the year we should place $6,000 of this net income in a sinking fund for unforseen repairs, there would still remain a clear dividend of $20,000 on the $7,000 invested.

"I just want to call your attention to one fact. Don't it strike you pretty forcibly that this stock may prove a second Bell telephone? We are now selling our stock at $1.00 per share. It may jump to high figures at any time. Well, I can show larger profits than the Bell telephone people ever dreamed of. Think it over."

We need only repeat the manager's sensible advice to prospective investors in $1.00 stock: "Think it over!"

PERSONAL.

Mr. C. J. H. Woodbury, of Boston, was a New York visitor last week.

C. J. Field, of New York, has been engaged by the Detroit Electric Light Company to take charge of its underground system of lighting in Detroit.

Sir David Salomons has given the Institute of Electrical Engineers, London, Eng., £1,000 to found a scholarship of £35 per annum, for three years, to be entirely under the control and at the disposal of the Institute.

Colonel G. E. Gouraud, the English electrician, who sailed for home on the "Umbria," last week, was tendered a banquet at the Hoffman House shortly before his departure. An event of the dinner was the reproduction by the phonograph of Mr. Gladstone's address to Americans. Colonel Gouraud will carry home with him in the phonograph the resolutions adopted by the Lawyers' Club complimentary to Mr. Gladstone, and spoken to the instrument by General Sherman.

Mr. Geo. B. Prescott, Jr., has resigned as electrician of the Electrical Accumulator Company, and on the 15th of this month takes charge of the business of the Kerite insulated wires and cables, 16 Dey street, New York. Mr. Prescott is an accomplished and well-known electrical engineer, and as general agent of this prominent manufacturing company will undoubtedly win a success as pronounced as he has already won in his technical and expert work in the past.

National Electric Light Association.

EXECUTIVE COMMITTEE MEETING AT THE ELECTRIC CLUB—A. R. FOOTE ELECTED SECRETARY, AND C. H. WILMERDING MEMBER OF THE COMMITTEE.

A meeting of the executive committee of the National Electric Light Association, was held at the Electric Club, Monday of this week, C. R. Huntley, chairman, presiding. Others present were, Marsden J. Perry, president; Jas. English, Dr. A. F. Mason, M. J. Francisco, John A. Seely and Allen V. Garratt, secretary and treasurer.

Mr. M. D. Law, of Philadelphia, tendered his resignation in a letter stating that he had moved to Denver, Col., to take charge of the Consolidated Electric Light Company, of that city.

Mr. C H. Wilmerding, of Chicago, was elected in Mr. Law's place.

A communication was read from the Hon. Robert Porter, superintendent of the census bureau, thanking the Association for its hearty co-operation in the matter of electrical statistics.

R. W. Ryan, of New York, was appointed official stenographer for the next convention.

In view of the fact that the present quarters of the Association will be required for other purposes on the 1st of May, a committee was appointed, consisting of John A. Seely, James English and Secretary Allan V. Garratt, to provide new headquarters for the Association. The question of the legal rights of the Association to use an official seal was referred to a committee of one, consisting of Secretary Garratt.

An entertainment committee of five members, Messrs. F. T. Walton, A. J. DeCamp, J. J. Burleigh, John A. Seely and the secretary, was appointed, with power to add to their own number, to appoint subcommittees and to fix the date of the semi-annual meeting.

A committee of three members was appointed to procure suitable papers for the next convention, as follows: J. E. Lockwood, of Detroit; C. H. Wilmerding, of Chicago, and A. F. Mason, of Boston.

The secretary, under the advice and consent of the president, was authorized to contract for the placing of such advertisements as he can procure, to be published in connection with the report of the official proceedings, and that the price of the proceedings be made $1 for all applicants.

The present secretary and treasurer, Mr. Allan V. Garratt, tendered his resignation, to take place on the 15th day of June, 1890, which was accepted.

The president nominated as secretary and treasurer, to take effect upon June 15, 1890, Mr. Allan R. Foote, of Washington, D. C. Mr. Foote's nomination was ratified by the executive committee, which then adjourned.

Mr. Garratt retires from office with the best wishes of all. His work has been most thoroughly and carefully done, and he has conscientiously labored in season and out of season for the good of the Association. We understand that he has not yet decided on his work in future. Mr. Foote, his successor, is well known to our readers as the agent of the census bureau for electrical data, and is enthusiastic in his work in the electrical field.

Telephone News

*** The telephone line between Berlin and Breslau is in such demand that it is deemed necessary to construct a second line.

*** Telephone communication between New Albany, Ind., and Louisville, Ky., was utterly wiped out by the recent cyclone.

*** Mr. Kerrigan has introduced a bill in the Albany Legislature, making telephone charges in cities of over 500,000, $6 a month; in cities between 100,000 and 500,000, $3.75 a month; in cities less than 100,000, $2.75 a month. Last week the assembly committee on electricity gave a hearing on the Clark telephone bill, which fixes the charges for the use of telephones in cities having a population of 1,000,000 inhabitants or over at $84 per year.

*** The Bell Telephone Company, of Canada, has concluded a contract for the construction of a double copper telephone line between the Dominion and Provincial Capitals. The new lines will run via Montreal, and when completed, conversation can be carried on between the three points named, a total distance of 280 miles, being the longest distance so far attempted in Canada for telephonic conversation. The cost of the line is estimated at $35,000.

The Lenox Lyceum Electrical Exhibition.

FORMALLY OPENED ON EASTER MONDAY.

The exhibition for the benefit of the New York Exchange for Woman's Work was opened at the Lenox Lyceum, on the night of April 7th, with great social and electric *eclat*. The boxes were all filled with parties in evening dress, and there were several hundred persons besides on the floor.

In the great main hall of the Lyceum was displayed the exhibit which the Edison companies made at Paris last year. In addition, a straight column, eight feet in diameter and 25 feet high, rose in the center of the hall from a mass of flowering plants. The column was white, and thousands of tiny lamps were set at regular distances in red bands that ran in long spirals around the column from bottom to top. The cap of the column was dead white, and covered with large incandescent lamps with white shades. From the summit of the column to the gallery were hung 12 slender ropes of smilax, which partly concealed hundreds of tiny lamps.

After opening addresses by Frederic R. Coudert and Prof. Cyrus F. Brackett, Mr. A. B. de Frece stepped to the front of the stage, and in a neat little speech declared the exhibition formally opened just as the watch marked 8.50. At the same time the band began to play a march composed by Rudolph Aronson for the occasion, and upon the surface of the big pillar in the center of the hall stole out a broad band of light twisting about it from top to bottom. The band of light wound slowly around the column like a luminous flat serpent, dazzling white with flashes of blue, green, red and purple scattered over it. At the same moment one of the long ropes of smilax burst into a flame of light with every color of the rainbow. It glowed for an instant and then went out. Another moment and the next smilax rope flamed out, blazed in dazzling brilliancy for an instant and then darkened again. Thus, in succession the touch of many-colored flame swept round and round the great circle of the hall, not in regular mechanical cadence, but irregularly, keeping time to the music that the band played, as though it were dancing. All the time the broad serpent of flame twirled ceaselessly about the column, until when the march was nearly done, the serpent's writhings stopped and the band of lights which formed it began to broaden. Gradually it spread out until when the music ceased every lamp in the column was aglow and the column had become a very pillar of brilliant light. At the same time the varicolored flames had stopped in their dance around the smilax ropes, and every rope was a blazing streamer across the hall. The hall glowed like a furnace, but with a light so soft that it could have been borne by the eyes of a babe. The music died out as if it had been smothered by the all-pervading light, and, as if in triumph of this victory over sound, a new blaze sprang from a mass of lights in the center of the dome, and about the walls on every hand scores of clusters of other lamps flamed out. In all, there were 5,000 lamps burning in the hall. Great applause greeted this impressive effect.

Mr. Edison, who had stayed out of sight until after the speechmaking was over, said that the exhibition was the finest of the sort ever given in the world, and exceeded in beauty the original exhibit at Paris. The lighting effects that were used were entirely new, and are to be attributed to that genius of light, Mr. L. Stieringer.

Besides the lights, there were scores of phonographs, with all sorts of queer attachments, a collection of electrical talking dolls, an electric railway, with electric signals and all other modern improvements in full automatic operation, and hundreds of instruments and appliances of a more technical nature, illustrating the principal inventions of Mr. Edison.

THE TELEPHONES.

Several rooms down stairs were filled with the exhibit of the American Telephone and Telegraph Company and the Metropolitan Telephone and Telegraph Company, New York. Two hundred instruments had been put in and connected with various places of entertainment in this city and in Boston. "The Grand Duchess" and the "Mikado" were constantly on tap, and those who preferred could listen to cornet playing, recitations and other entertainments, from Boston. There was also a "speaking telephone," which talked off so loudly that every one in the room could hear a speech that was being made for the occasion in Boston. The telephones were all connected with metallic circuits, such as are used by the long distance companies, and are being, too, gradually brought into use on city lines, and they worked perfectly.

The telephone work, which has been in the skillful hands of Electrician F. A. Pickernell, of the American Telephone and Telegraph Company, is a particularly successful feature, and is being admirably conducted. When it is considered that there can be heard at all of the 200 receivers the sound from one phonograph tube, and that were there enough telephones to put 200 on each of the six tubes which are connected for listeners at each phonograph, that 1,200 persons listening at the telephone receivers could plainly hear the music or speech from one phonograph, whether it is in Boston, New York or Philadelphia, the flexibility and astounding possibilities of the improved long distance telephone are at once suggested. The task of setting up these instruments, making proper connections, and securing the right locations at the theatres, so the operas can be heard to the best advantage, is one requiring special fitness, and Mr. Pickernell is to be most highly complimented, as well as the officers of the telephone companies, who have so willingly and liberally backed up the work.

The exhibition will be open afternoon and evening until May 15th. Several of what are expected to be among the most attractive features of the electrical portion of the exhibition were not ready on the opening night, but will be put into shape as rapidly as possible and added to the show. The success of the exhibition financially is already assured, and as it is for a charitable purpose it should receive generous patronage.

Heater for Compound Engines.

Our illustration shows the improved spiral corrugated copper tube feed water heater, especially designed for compound engines, constructed of cast iron domes, tube plates and shells, up to and including 300 horse-power (the larger sizes having steel shells), is built in sizes, from 15 to 5,000 horsepower being placed between the cylinders and condensers, can be used either horizontally or vertically. The steam passes in at one end, is sub-divided, and passes through the tubes (having 20 to 25 per cent. more area than the exhaust openings, which are 10 per cent. larger than the exhaust pipes used, consequently, no back pressure) thence to the condenser.

IMPROVED HEATER FOR COMPOUND ENGINES.

The feed water is pumped into the shell, and surrounds the tubes containing the exhaust steam, thence passing to the boilers, at a temperature varying from 115° to 132° Fahr., depending upon the vacuum carried, the full efficiency of 25-in. vacuum being 135° Fahr. The higher the vacuum, the lower the temperature, and *vice versa*. Eight to 10 per cent. is the usual saving by its addition, to say nothing of its easing the work of the condenser.

This is said to be the only heater in the world made for this purpose, and its success was made possible only by the use of the spiral corrugated copper tubes which are expanded into the tube plates, ringed up on the inside, overcoming all expansion and contraction, and absolutely a tight joint for an indefinite period; and like all heaters and condensers built by this company, is tested to 300 lbs. hydrostatic pressure, and sold with a ten years' guarantee. It is manufactured by the Wainwright Manufacturing Company of Massachusetts, No. 34 Oliver street, Boston.

Since the Western Union and Postal Telegraph Companies have raised the rates on the Chicago Board of Trade, the members threaten to build a commercial line of their own, which shall connect all the principal cities.

A GREAT TOURNAMENT.

THE FIRST NATIONAL FAST-SENDING TELEGRAPHIC TOURNAMENT A PRONOUNCED SUCCESS.—260 WORDS SENT IN FIVE MINUTES BY YOUNG MR. POLLOCK, OF HARTFORD.—NAMES OF CONTESTANTS, WITH THEIR RECORDS.

For several weeks past the telegraphic fraternity has been interested in the fast-sending tournament which came off last week, and which was the first one that was national in its character. The tournament was held in Hardman Hall, Nineteenth street and Fifth avenue, this city, which was specially fitted up with telegraph instruments for the occasion, Seth S. Barrett, of the Western Union, having charge of this part of the work, which, though rushed, was satisfactorily done. A number of keys of different manufacture were placed on a table on the platform, and about a dozen sounders were arranged around the hall and in the judges' room, so that messages could easily be read by sound in any part of the hall. The afternoon and evening of Thursday, April 10th, was devoted to the contest. Mr. Fred. Catlin, chief operator of the Western Union Telegraph Company, N. Y. city, the manager of the tournament, and who deserves high compliments for the success of his efforts, had secured the following-named gentlemen as officers of the tournament:

Judges—Walter P. Phillips, of the United Press; Thomas R. Taltavall, of the *Electric Age;* George H. Usher, of the Postal Telegraph Cable Company; E. F. Howell, official tester Western Union, and George E. Holbrook, of the *Daily World;* starter, Charles W. Price, of the ELECTRICAL REVIEW; timer, W. J. Johnston, of the *Electrical World.* Mr. R. J. Hutchinson, superintendent of telegraph of the Stock Exchange, who had been selected as the chairman of the meeting and master of ceremonies, was unable to be present on account of sudden illness, and Mr. Price was requested to act in his stead.

Hardman Hall was crowded by 2 o'clock in the afternoon, and in the evening the crush was such that a great many were unable to gain an entrance, good evidence of the great interest taken in the work of the artists of the key.

Mr. Catlin was introduced by the master of ceremonies at the opening of the tournament, and sent the following address, seated at the table, over his key, and it was listened to and applauded by the large audience, three-fourths of which probably understood every word that was so clearly sent, as probably that proportion were operators.

"75."

Members of the fraternity, ladies and gentlemen:

As a distinctly Morse audience, perhaps, you will agree with me, that it is not altogether inappropriate, in view of the occasion, that I should make my bow before you this evening in the language created by the father of our profession. I depend upon the poetic license of the circumstances to justify and approve the strangeness of the method.

With your permission, then, I will tender my respects and my observations in the language most familiar to our ears as a craft—the tongue of Father Morse. I am well aware that this decision closes to me the opportunity of pleading in extenuation of my short-comings, the trite excuse of a heavy cold or a sore throat, and as it would be simply stultification for me to enter a plea of "loss of grip," I throw myself upon your indulgence.

Before proceeding further, I desire to extend here my sincere thanks, without special mention of names, to the kind interests that have in their individual and collective capacity, so heartily seconded with golden words of encouragement, having a substantial silver lining, my efforts to bring this tournament to the consummation that you witness to-night.

The name of these friends is legion—telegraph corporations, electrical supply houses, news associations, the technical and the lay press and leading individual spirits pertinent to and identified with the profession at the present time or in the past; men who have made their bread-getting effort on the key, but who now, emancipated by their talents, are to-day shining lights in the respective

firmament of their election, embracing science, art, literature and commerce.

These "Battles of the Keys," ever growing more important and dignified, exert a wider influence for the general good than is apparent to the lay observer. The telegraph has frequently been called the right arm of the press, and I venture to christen the press the "Phonograph of the Telegraph." What the telegraph once breathes into existence the press perpetuates to posterity, to eternity.

Abreast with the marvels of the telescope, which elongate the human vision till the eye scrapes the very dome of heaven itself in the search of a man after knowledge, so it is an equally important part played by the telegraph key, with its hardened platinum larynx meshing the entire world in a net of living, vibrating intelligence, keeping in unison the metaphysical circumference of the globe.

The power which for 20 years past has maintained the substantial *status quo* of Europe is not the Bismarck of diplomacy—it is the telegraph key. Without it and the political synchronism it makes possible, the North Pole would, figuratively speaking, gyrate at a rate so different from the South Pole that one would twist the other up until either broke off short at the stump or unbelted the equator of the universe.

Now, these contests that bring us together to-night, develop the merits of special patterns of telegraph keys and intensify among manufacturers a rivalry to produce the best pattern of this article, irrespective of any reasonable cost. Every improvement in the key makes better work possible on the part of the knight who manipulates it, and this better work, when brought into due prominence, leavens the entire mass and heightens the standard of what is recognized as good telegraphic work, both with regard to speed and perfection of manipulation.

These judicial, dignified tournaments engrave that standard on ever visible and everlasting tablets, high in the sight, a pattern, a model for the emulation of the whole craft. This results in the advancement, the progress of a professional community, and that progress is unquestionably a spoke in the public weal.

The tournament to-day eclipses anything ever before attempted in a similar vein, and already an immediate effect has been the propagation of local tournaments of the same character all over the country. We now have the Southwestern tourney, the Northwestern tourney, and in 1892 or 1893, at a place to be selected, we shall have an international tournament that will in reality match the Old World's skill in this line against that of the New, and do incalculable good in exploding theories and fructifying facts and in establishing new bonds of interest and fellowship between the two hemispheres.

This tournament is a stepping-stone to that event. Not daring to risk wearying you further, I will now step aside to give place to the nervous force present, that is now at tension bent, cager for the fray.

Kind friends, thanking you one and all for your indulgence, I beg to express my sense of obligation to you and repeat my "73's." FRED. CATLIN.

We give below the names of the contestants, with the number of words and characters sent by each in the different classes. It will be noticed that some of the contestants were entered in more than one class, and it is interesting to observe the different records made at different times. It will be seen that W. L. Waugh sent exactly 229 words on each occasion, and in addition to carrying off the second prize in Class B, he also won the United Press prize for excellence combined with speed, in Class A.

There were a number of old telegraphers present, and the interest in the tournament remained unabated until its close, although the last decision was not rendered until after midnight. Among the gentlemen present were Gen. T. T. Eckert, W. B. Somerville, Gen. E. S. Greeley, W. D. Sargent, Jesse H. Bunnell, P. B. Delaney, John C. Reilly, Edward H. Johnson, E. A. Leslie.

A number of messages were received from out of town. One from John I. Sabin, of San Francisco, a well-known old-timer, was as follows:

"FRED. CATLIN, N. Y.—I endorse Walter Phillips' letter in ELECTRICAL REVIEW, April 5th. I offer same prizes on same conditions. Draw on me for $10, and any amount of love and best wishes of your old partner and old-timer."

This message, when read by the master of ceremonies, called forth much applause. Messages of regret were received from Charles H. Gogel, of Baltimore, another old-timer, and also from Harry Zeigler, Savannah, Ga. The New York Telegraph Club, through Mr. E. E. Brannin, president, tendered the freedom of its rooms, corner of New Church and Fulton streets, to all visiting telegraphers. Mr. J. D. Reid, the well-known telegraph man, now United States Consul at Dunfermline, Scotland, sent a message offering a handsome Cairngorm brooch to the successful lady contestant. The reading of Mr. Reid's name was received with enthusiasm.

At the conclusion of the work of Class A the judges made the following announcement:

"There is a division of opinion among the judges as to the direction the first prize in Class A should take. Only four of the judges were present when Messrs. Frank Catlin, Roloson, Pollock and Gibson, sent, and a ballot gives two votes in favor of certain ones and two in favor of certain other ones. Mr. Holbrook is now present and in order to secure a majority vote, Messrs. Catlin, Roloson, Pollock and Gibson, will be asked to send over again. The probabilities are that a majority vote can then be reached in favor of some one of the four for first place. The time of Messrs. Roloson and Catlin was phenomenal and that of Mr. Pollock probably surpasses all records. But the manipulation was imperfect and a new trial is therefore asked for with Mr. Holbrook present."

The record of the four contestants above named, on the occasions of their two trials, is given under Class A.

LADIES' CLASS.—NUMBER OF WORDS AND CHARACTERS SENT IN FIVE MINUTES.

Millie Moss	191-4
T. V. Froschel	200-5
B. M. Dennis	212-4
K. B. Stephenson	217
Annie M. Schaffer	193-2
J. Schlesinger	207
E. V. N. Garthwaite	201
M. C. White	169
L. Wagner	185-4
A. E. Findley	193
M. A. Daley	186-1
E. R. Vanselow	210-4
S. C. Barry	197

PRIZES AWARDED IN LADIES' CLASS.

First, $50	Miss K. B. Stephenson.
Second, $40	Miss B. M. Dennis.
Third, $30	Miss E. R. Vanselow.
United Press (excellence and speed), $25	Miss T. V. Froschel.

One young lady, Miss Erbelding, made three brave attempts to send, but was unable to get control of her nerves and, finally, gave it up. It was a severe test, indeed, to the participants in this class to come out before a large audience, composed largely of critical experts, and all the ladies deserve congratulations over their self-possession and generally excellent work.

OLD-TIMERS.—IN SERVICE PRIOR TO 1865.

J. H. Dwight	138-7
Fred. Catlin	217
A. S. Ayres	229
G. M. Eitemiller	197-4

AWARDS IN THIS CLASS.

First, $50	A. S. Ayres.
Second, $40	Fred. Catlin.
United Press, $25	A. S. Ayres.

Before getting down to work, Mr. J. H. Dwight, in the above class, ticked off the following message, which was received with laughter:

To All: I have done no real work at a key for near 20 years, but I thought I'd come up and let you have some fun with me. But I think Catlin ought to have put up some placards around the hall, similar to those posted by the manager of a theatre in Deadwood: "Don't shoot at the orchestra; they are doing the best they can."

CLASS A.—THE GREAT CONTEST.

A. J. Swan	215-2
F. L. Catlin	241-1
F. L. Catlin (second trial)	237
H. S. Wright	203-2
H. D Paulhamus	218-7
W. L. Waugh	229
J. P. Bradt	224
W. Davis	195
W. Davis (second trial, account time error)	194
M. H. Toomey	230-4
J. W. Roloson	248-3
J. W. Roloson (second trial)	246-2
B. R. Pollock, Jr.	258
B. R. Pollock, Jr. (second trial)	250
W. M. Gibson	239
W. M. Gibson (second trial)	238-4
H. Peters	217-2
F. J. Kihm	238
G. W. Simmonds	221-1

AWARDS IN ABOVE CLASS.

First, $100	B. R. Pollock, Jr.
Second, $70	W. M. Gibson.
Third, $30	F. J. Kihm.
United Press, $25	W. L. Waugh.

There was great interest in the above class, and the announcement of the decision of the judges, which was not given until quite late, was received with much applause, and Mr. Pollock, the "countryman from Connecticut," as some one put it, was the lion of the hour. He is a resident of Hartford, and is in the railway telegraph service.

CLASS B.—NAMES OF CONTESTANTS AND NUMBER OF WORDS SENT.

This class was open to all, barring those who had made a record of better than 11 minutes in the 500 word contest of 1885:

W. L. Waugh	229
Ed. Bishop	193-3
J. G. McCloskey	209
A. J. Swan	212-8
Frank English	225
H. S. Wright	211-1
D. Wark	224-1
H. D. Paulhamus	224-1
M. J. Doran	218
M. H. Toomey	228-6
F. L. Catlin	251-1
R. C. Mecredy	230-2
W. A. Jones	223
O. Hart	222
J. P. Bradt	220-2
C. W. White	218-8
A. S. Patterson	201-4
J. D. Hinnant	214
F. F. Norton	211
E. A. Sprong	208
W. Davis	193

PRIZES IN CLASS B.

First, $85	F. L. Catlin.
Second, $65	W. L. Waugh.
Third, $30	Frank English.
United Press, $25	J. P. Bradt.

It will be seen that young Mr. Catlin, who is a son of Mr. Fred. Catlin, the manager, increased the number of words sent by him in the other class, making the great score of 251 words and one Morse character. Mr. Wark and Mr. Paulhamus, who sent in the order named, reeled off exactly the same number of words. One contestant, C. G. Millard, gave up after wrestling with the key for about two minutes.

OTHER PRIZES.

The prize offered by Messrs. A. B. Chandler and Fred. Catlin, of $20, for the most perfect sending regardless of speed, was awarded to A. S. Ayres. Another prize by the same gentlemen in the same amount, to the receiving operator who made the best pen and ink copy from W. L. Waugh's sending, was awarded to Mr. Thos. R. Taltavall, editor of *The Electric Age*. Mr. Taltavall's work was most highly complimented.

Mr. W. B. Upperman received the messages in the caligraph, and is quite expert in this work.

THE KEYS THAT WERE USED.

There were four kinds of keys in use on the tournament table, all of which were illustrated in the REVIEW last week. The Bunnell key was used by 10 contestants, the New Haven Clock Company's key by 13, the Western Electric Company's key, the "Stiner," by 10, and the E. S. Greeley key, the "Victor," by 19 of the contestants. The great record, by F. L. Catlin, of 251 words and one character, was sent by a "Victor."

Mr. Pollock, who carried off the first prize, sent, first, 258 words with a Bunnell key, and on the second trial used a New Haven key, making his greatest record—260 words in five minutes. The New Haven Company only sent in its key at the last moment, as the work of extending its electrical department had caused the matter to be overlooked, and now realizes that it was a good thing to have a key there.

Among the men, the "Victor" key, apparently, was the most popular, 18 using it; nine using the "Stiner," seven the Bunnell, and five the New Haven.

The battery was complained of by some as being too heavy; others said some of the keys were dirty, but the general opinion was that the instruments were in as good shape as could be expected on such an occasion, and the fine records made would so indicate.

Lecture on Electric Railways at the Harvard Electric Club.

Capt. Eugene Griffin, of the Thomson-Houston Electric Company's railway department, lectured Monday evening, March 24th, in the Jefferson Physical Laboratory, Cambridge, Mass., to the Electric Club of Harvard University on "Electrical Transmission of Power." Every available seat in the lecture room was occupied, and when Capt. Griffin made his appearance he was cordially greeted by the large audience. The distinguished lecturer began his address by alluding to some of the recent theories by which electrical phenomena are explained; this was followed by a comprehensive explanation of the reversibility of the dynamo. In speaking of the dangers attending the use of electricity, he cited statistics to show that in New England there have been only five deaths by electricity in ten years, and of these five, four were employés. In the same time there have been 5,241 deaths from railroads, and of these, 2,902 were not employés. As a motor power for street cars, electricity has many advantages. Electric cars can be run at any speed up to 18 miles an hour, or even higher. Cars running at high rates of speed are less dangerous than those running at low rates. People are more cautious. If all the cars of the West End Company had been run by electricity during the past year, there would have been a saving of over $1,000,000 in money, and 100 years of time to the persons using them. The adoption of electricity means cleaner streets, and, consequently, a lower death rate.

Captain Griffin gave some very interesting figures in regard to number of roads in operation and under contract:

Year.	No. Roads.	Mileage.	No. Cars.
1885	3	7½	13
1890 (Jan. 1)	251	1,641	2,346

On July 18, 1888, the Thomson-Houston Company started the first car, now it is turning out 50 railway motors weekly, and has 1,100 motors on its unfilled order list. The combined horse-power of all the electric lighting stations in New England aggregate 17,000, as the result of ten years' growth; the West End Street Railway Company are now building a power station of 15,000 horse-power, and this is only one of three for the company.

TELEGRAPHIC.

.... The telegraph companies have abolished the special tariff on Chicago Board of Trade messages.

.... The new building of the Central District and Telegraph Company, of Pittsburgh, will cost $165,000.

.... The Atlantic Postal Telegraph and Cable Company last week elected officers for the ensuing year, as follows: A. B. Chandler, president; Wm. H. Baker, vice president; Edward C. Platt, treasurer; John O. Stevens, secretary. These gentlemen, with Theodore L. Cuyler, Jr., form the board of directors.

.... City Council has granted the Atlantic Postal Telegraph Company permission to enter Philadelphia. The chief provisions are that the new company shall transmit municipal dispatches between Atlantic City and Philadelphia free, and that they shall keep their business office open day and night from February 1st to October 1st.

.... The Direct United States Cable Company, Limited, has declared a quarterly *interim* dividend of 3*s.* 6*d.* per share, payable on the 24th *proximo*, in London. The Anglo-American Telegraph Company, Limited, has declared quarterly *interim* dividends of 12*s.* 6*d.* per share on the ordinary capital, and 1¼ per cent. on the preferred, payable in London, May 1st.

.... On March 28th, Edward Rosewater, proprietor of the Omaha *Bee*, explained his views on the subject of a government telegraph to the House Committee. He expressed the belief that the government can do the business in a much more satisfactory manner, and that a 10 cent or a 15 cent rate would be remunerative to the government, or to any well managed company. To support this assertion, he submitted the following statement:

A first-class operator can transmit by Morse instrument 40 words per minute. At an average of 30 words per minute he would transmit 1,800 words an hour, or 10,620 words in a day of nine hours. Computing each message at 30 words, and rate per message 15 cents, he would earn for the company $53.10 per day. Computed at 10 cents per message of 30 words, he would earn $35.40. Compute salaries of the operators sending and receiving at $3.10 per day, each, and four messengers delivering this business at $4, makes a total expense of $10 a day. Add $5 for blanks and envelopes and there still remains $20.40 a day clear gain, equal, for 313 working days in the year, to $6,385.20 net revenue. Deduct $1,385.20 for incidental expenses, and we have $5,000 a year, or 10 per cent. on $50,000 capital. At the rate of 33 words per minute, or 2,000 words per hour, a Morse line operated with duplex instruments for 10 hours a day, would earn $200 per day. Operated as a quadruplex its earning capacity would be $400 per day of 10 hours, or $600 per day of 15 hours. Manned by two sets of operators working an average of 7½ hours each per day the expense would be:

8 Operators at $3	$24 00
16 Messengers at $1	16 00
4 Office Clerks at $2	8 00
Blanks and Envelopes	8 00
	$56 00

A Heavy Suit.

Thomas Savage, Esq., of Boston, counsel for John W. Mackay, the California millionaire has entered a suit in the Superior Court for Suffolk county to recover a judgment for $287,313.36, which was accorded to Mr. Mackay by the Superior Court of New York in a suit brought by him against the Commercial Telegraph Company. The original claim of Mr. Mackay was for a note given by the defendant company on Oct. 4, 1889, for $285,916.50, and the difference in the sum sued for is the interest that has since accumulated. A large portion of the property of the defendant is situated in Boston, and an attachment upon the same has been made. Col. Robert G. Ingersoll is associated with Mr. Savage.

* * The ordinance authorizing the Duluth Street Railway Company to construct, equip and maintain, certain lines of electric street railway within the limits of Duluth, has been passed by the council.

* * An electric railway from Chicopee, Mass., to Holyoke is expected when the Willimansett bridge is built. The local street railway company is already anxious to secure the right of way over the coming structure.

* * The Electric Time Company, of Naugatuck, Conn., have their arrangements about completed for commencing business. The scale of prices for furnishing one clock and time to any party will be from $5.60 to $7 per annum.

* * Senator Martin last week, introduced a bill in the New Jersey legislature, asking for a law to prohibit the erection of poles or arches in any town or city on which to string electric wires for propelling cars, under a penalty of $1,000

* * St. Louis will have seven lines of street railway and 92 miles of track equipped with electric power as soon as the work can be done. By Jan. 1, 1891, says the *Globe-Democrat*, there will not be a horse car line in operation in St. Louis.

* * The *Street Railway Journal* is publishing an interesting series of articles on "Trams; Electric, Cable, Horse and Other," by C. B. Fairchild. In describing the electric railway, the development of the generator is the starting point, and the process of constructing the whole system is followed through in logical order.

* * Negotiations for the purchase of the property and franchises of the St. Cloud, Minn., City Railway Company are now in progress, with a fair prospect of being closed. If the sale is made, the purchaser—said to be Mr. Thomas Lowry, of Minneapolis—is to extend the lines very considerably, and use electricity as the motive power.

* * The new electric locomotive, designed to tow as many as four cars, which has been for some time in course of construction at the Thomson-Houston Electric Works, was tried on Saturday on the Lynn tracks, Lynn, Mass. It weighs seven tons, and the size of the wheels is 36 inches. It is run by two motors of 20 horse-power. It has an air brake run by a one horse-power dynamo with a wheel. It runs easily 20 miles an hour. It has a fender much like the cow-catcher of a steam locomotive. It is designed for use on the West End Railroad.

* * A few days ago the Minneapolis Street Railway Company awarded several contracts for the material for the electric roads that are to be equipped in the twin cities this year, and for the cable line in St. Paul. John A. Roebling's Sons' Company, of Chicago, will furnish 350,000 feet of insulated overhead copper wire. The Walworth Manufacturing Company, of Boston, will furnish the poles, and H. F. Brown & Company, of Minneapolis, will furnish the 85,000 ties. The contract in each case was let to the lowest bidder.

Important Electric Railway Contract.

The following is from the Pittsburgh *Chronicle-Telegraph*. The contract mentioned is one of the largest of the kind ever placed in this country:

"Mr. John E. Ridall returned last week from Rochester, N. Y., where he succeeded in placing a contract with the Sellers McKee Street Railway Syndicate for an electric system to be put in use on its roads. The contract embraces 68 miles of single track road and 100 cars, with two motors to each car and 1,100 horse-power generators. The power for these generators will be water.

"The cost of the electrical portion of the system will be over $360,000. In addition to the Rochester road, the same syndicate owns street railway lines in Troy and Buffalo, and the Birmingham line in this city, and it is said that the same motive power is to be put in use on all the lines this year. The Short system, of Cleveland, will be the one used.

"Mr. Ridall has also placed a contract for the same system with the Johnstown Street Railway Company, calling for 10 miles of road and 10 cars."

Improvements in Dynamo-Electric Machines and Motors.

Mr. James Swinburne, the well-known English electrical engineer, has recently been granted patents on some improvements in alternating current motors. In his patent specifications, Mr. Swinburne expresses himself as follows:

"Alternating current motors, as at present designed, are either special machines or machines resembling alternating current dynamos. My invention refers to the latter class. At present the usual way of utilizing such machines as motors, is to design them so that they are kept in step with the generators by their self-induction, or, as I prefer to explain it, by their own unassisted armature reactions, which is a wasteful way of working; because the maximum armature current and back electro-motive force are not at the same times. According to my invention, an alternating current motor is designed so that at any instant its back electro-motive force is just less than the electro-motive force on its terminals by enough to cause the armature current needed to give the power. At no load such a motor should give a back electro-motive force which at any instant is almost exactly equal to the terminal electro-motive force. At full load the field is weakened enough to let the necessary current pass; so that the motor does not need to lag much and weaken its field by the reaction of its armature current.

"I produce this effect in several ways. According to one method, the motor is self-exciting. The field magnets are excited from a commutator in connection with a special armature circuit, or, on starting, with the main circuit. After the motor is started I prefer to excite it from a special armature circuit. To avoid sparking, it is sometimes advisable to have two exciting armature circuits and two commutators. Two field magnet circuits are then arranged so that the alternating currents produced in them differ in phase by a quarter of a period. A closed coil may also be wound on each of the field magnets so as to prevent any perceptible fluctuation of the excitation. In most cases this is not necessary. This method of excitation may be used either for alternating generators or motors.

"In the other case of a motor the exciting circuits are so arranged that at no load the field excitation gives a back electro-motive force approximately equal to the electro-motive force in the mains. If it has very nearly the same back electro-motive force the motor at no load becomes cophasedly synchronized, and takes just enough current to drive it and give power for excitation. It is best to allow a margin so that the back electro-motive force is a little less than the main electro-motive force. The motor then leads a little at no load. This slight lead allows a small armature current to pass which strenghtens the field by reaction. This increases the excitation, as the exciting coils in the armature come under the influence of the same pole pieces. This increases the back electro-motive force, so that neither the lead nor the armature current becomes excessive. If too much margin is allowed, the motor will lead too much, and will take a large current at no load, which is wasteful.

"When load is put on, the motor begins to lag. The armature current then reacts on the fields and weakens them; this weakens the field excitation, as the exciting coils are influenced by the same field magnets, and the field can thus be weakened enough without much lag. The field excitation should be so designed that the iron is not highly magnetized. On the other hand, it must not be too sensitive.

"Though in my provisional specification I proposed to use a double field circuit, as just described, I now prefer to use a single field circuit connected with the double armature exciting circuit. The two armature circuits are then coupled up to a commutator as in an ordinary closed or open armature circuit direct current machine. The field excitation is then still affected by the main armature current's reaction on the field magnets.

"The field excitation may be lessened more directly at full load by passing the main current of the motor round the field magnets, after commutation. This arrangement can be employed when the machine is separately excited. This main or series demagnetizing current may be taken round the field magnets of the exciter instead of round the alternator field magnets, but I prefer to act on the alternator magnets.

"All these methods depend for their final adjustment on the lagging of the motor as the load increases, but instead of being considerable, the lag is small, because the current turns round the field magnets are fewer at full load than at light loads.

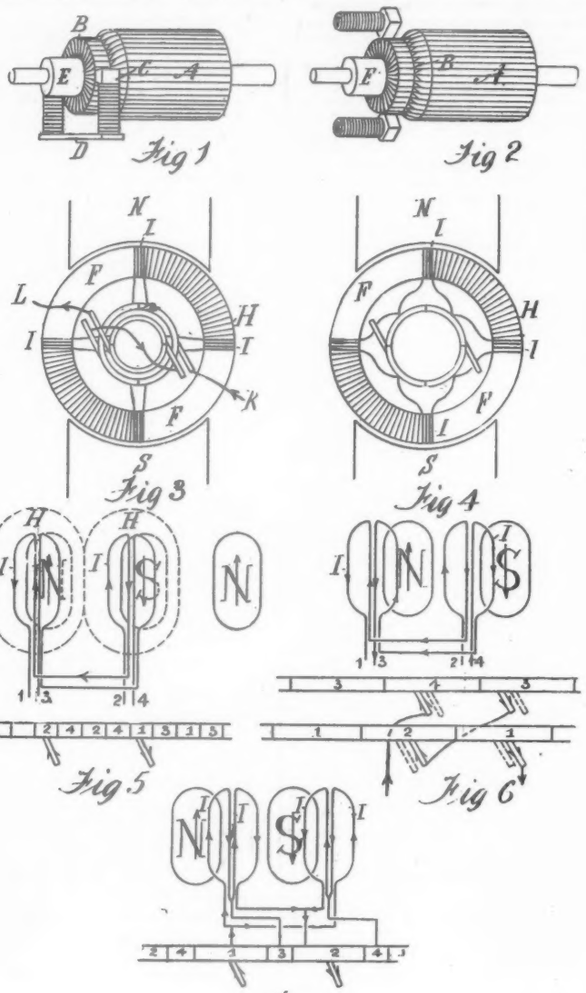
"As the problem of running alternators in parallel as generators is akin to that of running them as motors off parallel supply circuits, machines made according to my invention are suitable for parallel running generators. For instance, if two or more self-exciting alternators of the kind described are in parallel, and one falls behind, or lags a little, its field is at once weakened in a much greater degree than it would be if the ampere turns on it remained constant.

"If the motors with backward mains or demagnetizing field circuits in series with the armature are used as generators the direction of the main currents is reversed, and they become compound wound alternating current dynamos; and they may be coupled up to run in parallel like direct current compound wound generators.

"To start an alternating motor I use one of the methods already mentioned by me in earlier patent specifications; namely, starting by connecting batteries with the direct current exciter; starting by turning the alternating current into the exciter, which has, preferably, in this case, laminated magnets; or starting by connecting the armature and field magnets of the motor with the alternating current.

"The method I prefer is to shift the brushes of the series circuit on starting, and to turn on the alternating current gradually. The brushes are shifted back to their normal position when the motor has attained its normal speed.

"When there is no series circuit, and there are two armature exciting circuits, and two field circuits to correspond, the motor may be started by putting one field circuit with its commutator in series with



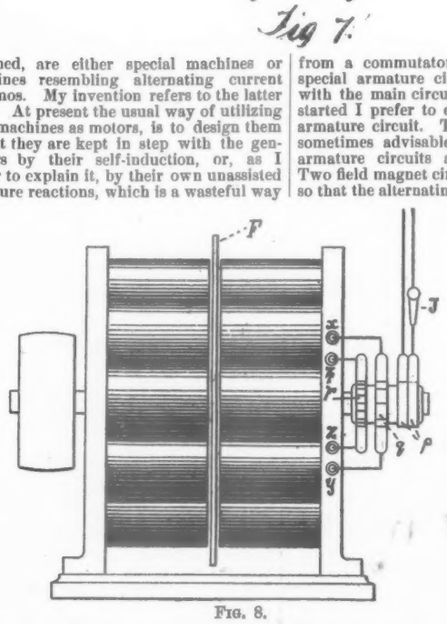


Fig. 8.

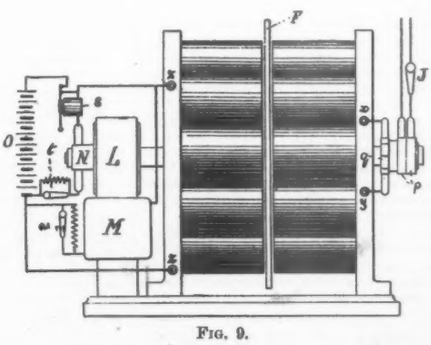


Fig. 9.

the armature circuit, and passing the main alternating current through. When synchronism is attained, the connections are altered. The necessary connections for such alterations are more easily arranged in machines in which the field magnets revolve, while the armature is stationary.

"A special commutator may be used for starting only, as the sparking is rather destructive before synchronism is attained. Secondary cells are most convenient for starting large motors, in which the sparking is most serious when started with an alternating current. Secondary cells may be used to start a self exciting motor, especially when two armature circuits and one field circuit are used. The cells are used to bring the motor up to speed, or a little above speed; the alternating current is then switched on through a resistance. The cells may be charged again two in parallel, with a resistance in circuit, but should not be left on when the motor has a load, as they would interfere with the variation of the field excitation.

"Transformers may be used to give the electro-motive force required in any circuit.

"Fig. 1 is a diagram of a reversing armature and magnet attached to an armature and commutator. A is the armature of the dynamo or motor, and E the commutator. B is the reversing armature core, in the periphery of which the commutator connections are embedded, and C is one pole of the reversing magnet. A yoke, D, is shown, but in practice the vertical parts of the magnet are mounted on the bed-plate. The brushes make contact at the sides of the commutator so as to touch the sections that are connected to the armature section whose current is being reversed by the pole pieces. The main armature is wound in the usual way, but the commutator connections pass through narrow grooves in the reversing armature, B, and then pass in radially to the commutator in the usual way.

"Fig. 2 shows the reversing magnets arranged in another way. They are mounted on an iron cross bar, which is not shown, and which forms the yoke. This cross bar also carries the brushes, so that the position of reversing magnets and the brushes may be varied simultaneously, the brushes always being under the reversing pole pieces. It is advisable to allow for a small adjustment of the brushes relatively to the reversing magnets as well.

"Figs. 3, 4 are diagrams showing the commutator sections and connections of alternating current motors according to my invention. F is a ring armature. For the sake of simplicity a two pole machine is taken, though in practice it is better to have six or more, so that speed is not too great. H H are the active coils or main coils of the machine. They are connected to collecting rings as usual which are not shown in the diagrams. I I I I are the exciting coils of the armature. In Fig. 3, two commutators are shown, one within the other; they are actually mounted on a hob side by side and are of the same diameter. The connections are made, as in many arc machines, by connecting the pairs of brushes in parallel. The insulating spaces may then be made large, so that each coil is cut out of circuit for a time when it is giving little or no electro-motive force. The brushes and pairs of coils may be connected in series, as shown in Fig. 3. In that case the insulating gap is small, so that there is always a circuit through each commutator. Insulating sections may, even in this case, be used to cut the coils out of circuit when not active, but they must, of course, be connected across. The opposite coils are shown connected in parallel; they may be coupled in series. The brushes are in connection with the field magnets by the leads K L. If the armature is stationary and the field rotates, the brushes are connected to the armature coils, and the sections of the commutator to the field circuit.

"In Fig. 4 the exciting coils are connected up as in a Gramme ring. This arrangement demands four brushes and two sections when the armature is stationary and the field rotates.

"Fig. 5 is a diagram of the exciting armature coils in a machine whose armature is made of flat strip without an iron core. The artist has shown the main coils, H H, and pole pieces, N S N, with parallel sides, instead of radial, for the sake of simplicity. The main armature coils are shown as dotted flat oval coils H H. They are connected to collecting rings in the usual way, and the connections are not shown. Inside the main coils, in the space at present generally left vacant, are pairs of exciting coils shown as full lines, I I. These coils are more clearly distinguished in Figs. 6 and 7, where the main coils H H are omitted. N S N are diagrammatic representations of the pole pieces in Figs. 5, 6 and 7. The arrows on the pole pieces show the direction they induce a current when a conductor passes from right to left. The arrows in the coil circuits show the direction of the induced exciting currents.

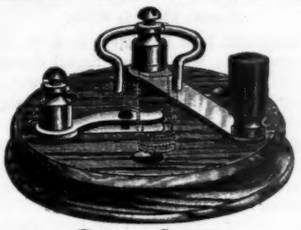
"In Fig. 5 two pair of coils are shown. Each pair is connected in series. One, two are the ends of one pair, and three, four the ends of the other pair. In an actual machine instead of two pairs there are two sets of correspondingly situated coils, coupled preferably in series. Below the diagrams of the coils in Figs. 5, 6 and 7 are diagrams of the commutator sections and the brushes, which are connected with the field magnet circuit. The numbers on the commutator sections show which ends of the coils I I are connected to them. In Fig. 5 each set of active coils is in circuit when it has an electro-motive force induced in it, the other set being out of circuit. Fig. 6 is analogous, roughly, to Fig. 3. There are two commutators and two pair of brushes, and the sets of coils are in series. For starting the motor the brushes are shifted to the dotted positions, and the main current is passed through both the field and armature circuit; and when speed is attained, the connections are altered. Fig. 7 shows an arrangement somewhat analogous to Fig. 4.

"Fig. 8 is a diagrammatic view of a dynamo or motor according to my invention. p is the collector for the main armature current, q is the commutator in series with the armature circuit for weakening the field in the case of a motor, and strengthening it in the case of a dynamo, $x y$ are the terminals of the main or series field coils, r is the commutator in connection with the armature exciting coils, for exciting the field magnets, and $z z$ are the terminals of the field circuit connected to it. To start the machine as a motor the brushes of the series circuit are shifted so that the series wire magnetizes instead of demagnetizing. The main current is then turned on through a safety resistance. When the machine has reached its normal speed, the brushes are shifted to their proper position and the load is put on.

"Fig. 9 is a diagrammatic view of a separately excited alternating motor with secondary cells for starting it by their action on the exciter. p is the ordinary ring collector for the main armature current. q is the commutator for rectifying the main armature current before it is passed round the fields to demagnetize them. $x y$ are terminals connected with the main series, or demagnetizing circuit round the field magnets, and with the brushes bearing on the commutator q. The exciter is shown to the left. L is one pole piece, M one shunt field coil, and N the commutator. There is no series winding on the exciter. O is a secondary battery, which is in shunt to the exciter when the armature of the electro-magnetic cut-out s is held on. If the motor is running at its normal speed the exciter charges the batteries when the armature of the cut-out s is held on, and also excites the field magnets of the alternator, as the brushes of the exciter are connected with $z z$, which are the terminals of the exciting coils of the field magnets of the alternator. To start the motor the switches t and u are opened, J being already opened, and the armature of the cut-out s is held on. The secondary battery then discharges by three paths in parallel, namely, (1) the armature of the exciter, through the resistance in shunt to t, by the commutator N of the exciter, and through the cut-out magnet s; (2) the shunt coils of the exciter, through the resistance in shunt to w; and (3) through the main exciting coils of the main machine connected with the terminals $z z$. The resistance in shunt to t is to prevent an excessive armature current when the cells are switched on while the machine is still at rest. The exciter then acts as a motor and starts and drives the whole machine. As soon as a fair speed is attained the switch t is closed so that the whole pressure of the cells is on the exciter armature. The resistance in the exciter's field weakens it so that as a motor it goes faster, and a speed somewhat above the normal is attainable if desired. When normal speed is attained J is closed, and the large machine begins to act as a motor; w is then closed and the field of the exciter is strengthened so that it becomes a dynamo. At the instant of reversal of current through s the armature of the cut-out falls off, but is drawn on again by the current passing through s to the upper terminal z of the main field magnets. The exciter gradually charges up the cells again. To stop the motor, J is opened. The speed then falls slightly so that the cells can drive the exciter as a motor again, but the reduction of the current through s releases the armature of cut-out and disconnects cells."

A New Electric Switch.

The cut illustrates a simple switch that can be used where a single contact is needed, but where the necessities of the case do not justify the use of a more expensive switch. The dotted lines show the switch closed. In this position the arm is forced between two straps of brass giving a larger surface contact on both sides of the arm. The



ELECTRIC SWITCH.

spring at the back holds the arm away from the contacts when the switch is opened, so that there is no danger of any accidental contact. The switch is placed on the market by the Central Electric Company, of Chicago.

Robinson Radial Car Truck.

The Robinson radial car truck is a new invention which bids fair to take a leading place among such devices. The patents are owned by a Boston company, and several of the cars have been in daily use on the West End system in that city.

Fig. 1 represents a truck or street car of ordinary construction with rigidly parallel axles, showing how it gets around a curve in the direction of the arrow. When the wheel A strikes the curved rail, the rail resists the shock and causes the wheel to rebound or glance; at the same instant the propelling power gives a forward impetus to the truck or car, when the wheel again strikes the rail

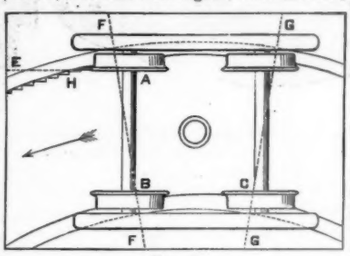


FIG. 1.

with great force and again rebounds. The course which the wheel travels is indicated by the saw-tooth line H in the accompanying cut. Thus the truck or street car finally gets around the curve, not by rolling, in accordance with mechanical principles, but by a succession of blows or jerks, commonly called "grinding"; it is skidded around by main force.

Fig. 2 illustrates the position which the axles and wheels, as used on the Robinson truck, assume in running over the curved track B. The axles automatically assume an exactly radial position on any curve upon which the car runs, and the power required to propel this car around curves is little, if any, more than that required to propel it on a straight line.

The radiation of the axles diminishes the power required to propel cars around street corners from 50 to 75 per cent. and often more than this, and also makes it possible to roll cars around street corners easily which without the radial axles, could not, by any possibility, be got around such curves on the rails, however much power might be applied. That is, this invention renders easily possible that which is now impossible.

The "grinding" on curves, inseparable from all car trucks with rigidly parallel axles, that is, all now in use, is entirely obviated in our radial electric motor car. In this car each axle is always at right angles to the line of travel, whether on a straight line or a curve; that is, the axles automatically, but positively, adjust themselves to the changes in the direction of the line of travel; they are always parallel on a straight track, and radial on curves.

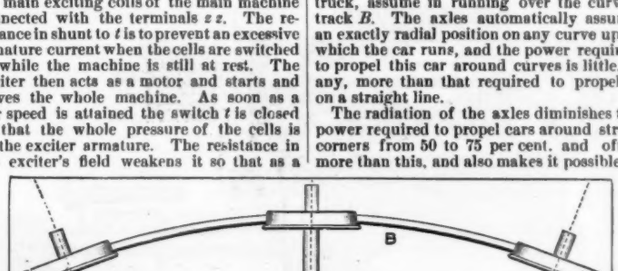


FIG. 2.

ELECTRIC LIGHT NEWS

—— Spartanburg, S. C., will soon be permitted to enjoy the advantages of the electric light.

—— The gas company and seven electric light concerns at Cincinnati are reported to have combined all their interests.

—— The New York Edison Electric Illuminating Company has declared a quarterly dividend, payable May 1, 1890.

—— An Edison electric light station in this city has been complained of as a nuisance. The people in that vicinity must be extremely nervous.

—— The Tacoma, Wash., Electric Supply Company has been awarded the contract to furnish the large hotel at Anacortes with all the modern electrical appliances.

—— The contract for lighting the city of Anderson, S. C., has been awarded to Messrs Roddy & Whitner, of Rock Hill, S. C. The work is to be completed at once.

—— The North Adams, Mass, Electric Light Company has contracted to light the town. The company will put in 45 lights, an increase of 32 over the present number. The lights are to burn every night during the year.

—— The new arc lighting system of the Westinghouse Electric Company is to aid in dispelling the nightly darkness at Troy, N. Y., in the near future. The Westinghouse Electric Company has received an order from that place for a 60 light machine.

—— The Merchants' Electric Light Company has been organized at Portland, Me., (to furnish electric light and power) with the following officers: President, Geo. F. Talcott, Rockville, Conn.; treasurer, Wm. T. McDonald, Rockville, Conn. The capital stock of the company is $25,000.

—— At the annual meeting of the stockholders of the Cincinnati Electric Light Company, Cincinnati, O., the following were elected as directors for the ensuing year: A. Hickenlooper, R. Allison, Wm. A. Goodman, A. J. Kenan, E. V. Brookfield, C. H. Law and Sam'l J. Broadwell.

—— Salt Lake City, headquarters of the Latter Day Saints, is to have a lighting plant, to use the Westinghouse alternating current incandescent system. The initial capacity of the plant will be 500 lights only, but the prospects are good for an increase at an early date after getting the apparatus at work.

—— The Detroit Electric Light and Power Company has adopted a plan of insuring its employés. Every employé carries a $5,000 policy, the premiums on which are paid by the company as long as he is in their employ. The arrangement protects the employé's family from accidents and the company from damage suits in case of accident.

—— At the annual meeting of the Royal Electric Light Company, held in Montreal, last week, a quarterly dividend of two per cent. was declared. The directors were authorized to increase the capital stock to the full amount of $500,000 as occasion might require, $250,000 being now paid up. The old board of directors was re-appointed.

—— Mr. P. A. Underwood, the genial manager of the Nantucket Electric Light Company, reports that "the town of Nantucket, Mass., voted recently to increase the number of its street lights, and authorized his company to add 15 arc lights to the street circuit." A number of New York gentlemen who are erecting summer cottages near Nantucket have contracted with the above-named company to run its mains from the central station, and to furnish incandescent as well as arc lights for the buildings alluded to and surrounding grounds, respectively.

ELECTRIC CLUBS.

NUMEROUS ORGANIZATIONS IN THE UNITED STATES.—VISITORS, MEETINGS AND LECTURES.

The number of electrical organizations of a social and practical nature that have come into existence in this country is quite numerous. Some that have not heretofore been mentioned in this department of the REVIEW are given herewith: The Eddy Electric Club, George Briggs, president, Windsor, Conn.; the Massachusetts Electrical Engineers' and Mechanics' Association, R. Vose, secretary, *Herald* Building, Boston; Buffalo Electrical Society, Buffalo, N. Y.; Technical Electric Club, T. W. Swanton, secretary, Massachusetts Institute of Technology, Boston; Spokane Falls Electrical Society, Spokane Falls, Wash. There are, no doubt, other organizations, which will be noted in subsequent issues of the REVIEW.

New York Electric Club.

The Annual Election of the New York Club occurs Thursday evening of this week, and promises to be largely attended. Now that the organization may be said to have passed the uncertain stage and has become a decided success, and has reached a financial standing gratifying to its promoters, the honor of being an officer in it is all the more appreciated.

The Fishing Season has opened, and, as a number of members are experts in this field, the Club has already commenced to echo with stories of successful angling. Mr. Henry Hine, who is quite an enthusiast of the rod and line, reports a catch of 50 trout inside of 67 minutes made on Friday last. As a commencement this is such a good representation (mark the word, please) that some of the other fishermen are a little disconcerted, but will no doubt be heard from later.

Mr. Emil Huber, son of the president of the famous Oerlikon Works, near Zurich, and a prominent engineer and electrician, is visiting this country, with headquarters at the Electric Club, as a guest of Hon. Grosvenor P. Lowrey.

Among Recent Visitors are John D. Moore, Lawville, N. Y.; W. H. Morrison, Lawville, N. Y.; G. D. Green, Syracuse, N. Y.; C. P. Samprey, Syracuse, N. Y.; Mr. Brox, Port Jervis,; Mr. Johnston, Boston, Mass.; W. S. Hill, Boston, Mass.; C. L. Leet, Springfield, Mass.; H. E. Smith, Buffalo, N. Y.; H. C. Palmer, Buffalo, N. Y.; E. F. Davis, Philadelphia, Pa.; Geo. M. Eitemiller, Pittsburgh, Pa.; R. Eickemeyer, Jr., Yonkers, N. Y.

Chicago Electric Club.

The Regular Meeting of the Chicago Electric Club was held at the rooms of the Club on Monday evening, April 7th. After the reading of the minutes of the last meeting by the secretary, W. A. Kreidler, and the treasurer's report by F. S. Terry, in which latter a good showing was made by the increase in members, the paper of the evening was called for by President Beach. The title of the paper was "Storage Batteries to the Rescue," by Mr. J. K. Pumpelly. The paper and the discussion called forth by it was listened to with great interest, especially some valuable points given by Mr. Bauer, electrician for the Pullman Palace Car Company, in the use of storage batteries in train lighting.

The New Library of the Club, consisting of 410 volumes, will soon be placed in position and will be found an interesting and valuable addition to the Club.

The Growing List of membership of the Club shows that the interest taken is on the increase.

Edwin Floyd, purchasing agent of the Thomson-Houston Company, was changed from a resident to a non-resident member. Mr. Floyd's many friends will be sorry to learn that he is to leave Chicago this month to make his home in Boston, Mass., and all realize that in his departure the Club loses a valuable and popular member.

The Polls for the annual election of officers will be open from 7 until 9, on election night. The meeting will be called at 8 sharp.

W. A. Sheldon, general agent of the Schuyler Electric Company, was a visitor at the Club this week.

April 10, 1890.

Boston Electric Club.

Lieutenant John P. Finley, U. S. A., in charge of the Weather and Signal Station at the Boston post office building, was a guest at the Club rooms on Thursday evening.

Mr. J. P. McQuade, of the International Electric Conduit Company, New York, was a guest at the Club rooms on Wednesday evening; and initiated several of the Club aspirants for pool notoriety into the mysteries of intricate combination shots.

The Next Club Dinner will take place at The Quincy. Mr. Joseph Wetzler, editor of the *Electrical Engineer*, will read the paper, entitled: "Electric Railway Evolution," which will be illustrated by lantern slides.

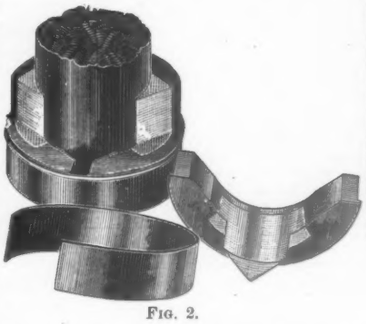


FIG. 2.

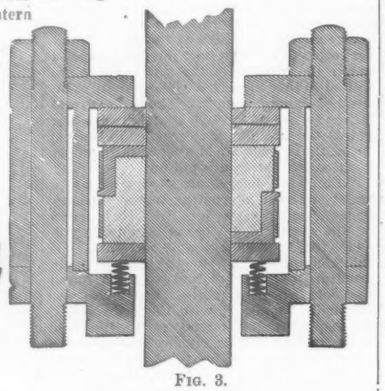


FIG. 3.

The New England Electric Exchange holds its annual meeting at the Club rooms on Monday afternoon, April 14.

It is stated that the present officers of the exchange—who have served from the time of its formation—have declined to be candidates for re-election. The officers are, P. H. Alexander, president; Henry B. Cram, secretary and treasurer; and Messrs. Frank Ridlon, Andrew Robeson, J. T. Bradbury, with the president and secretary, constitute the board of directors.

The Steward, Wm. J. Allen, is very popular with the members. All who have partaken of William's popular salads and "toothsome" *entres* will bear testimony to the worth of the Club's steward.

Boston, April 12, 1890.

Franklin Experimental Club.

This is a Newark, N. J., Club, organized about three weeks ago. The Club was founded for solid, practical work, and there are few like it in the United States. Its meetings are held every Friday evening, when the members give a 15 minutes' talk each in explanation of the work they are doing in the Club laboratory. Once a month each member is required to submit an original experiment, the result of individual research. From these requirements it will be seen at once that the Club is practically an organization of students who come together for educational and instructive purposes solely. There is no attempt to give a social aspect, and it would interfere with the Club's prime objects.

The Officers are as follows: President, William J. Hammer; vice-president, Dr. Theodore Corwin; curator, Prof. George C. Sonn; secretary, Edward W. Hammer.

General Club Notes.

Fifty-four Electricians met in the Boston *Herald* building last week, and formed a society to be known as the Massachusetts Electrical Engineers' and Mechanics' Association. These officers were chosen: President, John Dean, Jr.; vice president, James E. Monroe; secretary, R. Vose; financial secretary, C. H. Tyler; treasurer, Andrew Hanson; conductor, W. C. Woodward.

The Officers and Employes of the Eddy Electric Company, of Windsor, Conn., have organized a Club to discuss questions relating to electricity. George Briggs was chosen president, and A. H. Eddy, Arthur Briggs and Harry Heath, vice-presidents. The Club will meet in the rooms in the upper part of the building, every Friday evening.

Tripp Metallic Rod Packing.

This is claimed to be the only "scientific packing" ever invented for packing rods or stems against steam, water or air. It is simple in construction, and can be put on the piston rod or valve rod (see Fig. 1) by an engineer, as no changes have to be made; simply removing the glan and adjust the case on the same bolts.

The packing ring, when on the rod, is virtually a solid piece of metal, susceptible of opening and closing, and adjusting itself to any slight variations of the rod. It is so constructed that no section or piece is independent of the others, consequently they must open and close equal and all wear alike, giving the least possible friction, as all parts bear equally on the rod. If the rod does not run in line it makes no difference, as there is sufficient space in the case and around the rod to meet all variations and still be tight.

Fig. 2 is an elevation of a packing ring composed of four pieces, on a rod, with one spring off, and one piece removed, showing its construction; the light color showing babbitt metal, the dark color, brass composition.

A sectional view of this ring in position on the rod is shown, with front and back ring and springs, in Fig. 3.

Among the advantages claimed for the Tripp metallic rod packing are that it gives no more trouble than ordinary packing rings in the cylinder, and will run until worn out and not leak or give any trouble. This packing is manufactured by the Tripp Manufacturing Company, No. 180 Summer street, Boston, Mass.

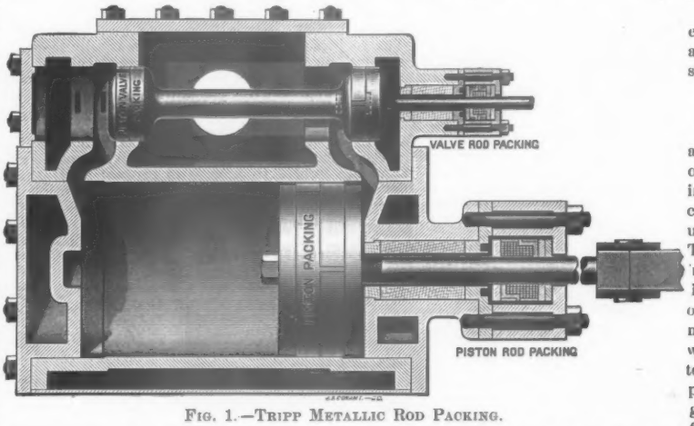


FIG. 1.—TRIPP METALLIC ROD PACKING.

A Letter From Nova Scotia.

This communication is interesting in that it sets forth the views of a manufacturer in regard to electrical power for manufacturing establishments.

TO THE EDITOR OF ELECTRICAL REVIEW:

As I am too busy in other lines to be fully "*en courant*" as to recent achievements or projected departures in electrical engineering and therefore may be giving "paper news" in calling attention to a possible field for electricity that is well worth cultivating: The distribution of power in factories from prime motors to the machines to be operated, without the intervention of long lines of shafting, of pullies, belts, etc.

The economic position of the two systems could easily be ascertained and their respective percentages of loss set off one against the other, as well as the first cost of the respective plants.

In the one case there would be lines of shafting, counter shafts, pullies, beltings, lacing and oil; the need for strong well timbered buildings to preserve alignment; the power absorbed in moving the heavy masses and the belts; the slip of belts; the wear and tear of belts, etc.

For the other the percentages of loss in transmitting from the dynamo to the different machines (I assume a dynamo of the Ferranti or some similar type with a large armature driven directly from the engine shaft, would be the best adapted for this service); the outlay for the dynamo and motors for each machine and wear and tear.

Whichever, under present conditions, had the best of it from a dollar and cent standpoint, there can be no question that if at all practicable, the electrical transmission would be so immeasureably superior in every other way as to render a careful study of the problem, with a view to bring it within the field of practical electrical engineering, well worth consideration.

The perfect simplicity attainable; set the machine up and wire to its motor, to stop and start—a touch on the switch.

Yours very truly,

EDWARD LAWSON FENERTY.

Halifax, N. S., March 31, 1890.

On Galvanometers.

For over an hour last Saturday evening Professor Robert Spice, professor of chemistry at Cooper Institute, and of natural science at the Brooklyn High School, spoke to a large and appreciative audience on "Galvanometers." It was the occasion of the second of a series of six lectures which Professor Spice is delivering before the department of electricity at the Brooklyn Institute. The Professor's lectures are exciting a great deal of interest among the students of electricity, and the large hall of the Institute was none too large to accommodate the audience.

Professor Spice, in the course of his lecture, explained the action of the galvanometer and illustrated his remarks by means of a stereopticon.

Electric Welding.

The largest Thomson electric welding apparatus yet produced welds a copper bar of an inch in diameter, a brass bar of 1⅛ inches, or an iron bar of three inches, a current of 30,000 amperes, of the low pressure of one or two volts, being necessary. To carry such an enormous current without heating, a solid copper bar 8½ inches in diameter is used as the secondary conductor of the transformer which converts an ordinary dynamo current (passing over a small wire) into one of the great volume and low tension needed. To produce the current by primary battery would require 90,000 telegraphic battery cells for an electro-motive force of one volt, and double that number for two volts. For welding each square inch of a section of iron or steel in 40 seconds, about 30 indicated horse power is exerted by the steam engine during the production of the current, though smaller power suffices for less rapid work. Platinum and German silver wires as small as one-fiftieth of an inch in diameter have been united by this system, and work under the microscope might be done if desirable. The smallest currents now used range between 200 and 300 amperes.

Work on the electric railroad at San Jose, Cal., is progressing rapidly, and the cars are expected to run at an early date.

The Gethins Electrical Manufacturing Company, Boston, Mass., has just received an order from the Mexican Central Railway for 50 of its gravity batteries.

KINDRED INTERESTS

The Forest City Electric Works, W. B. Cleveland, proprietor, have removed their factory to Geneva, O., where largely increased facilities will enable them to keep up with their rapidly extending business.

The Valley Iron Works, of Williamsport, Pa., will, in a few days, have ready for shipment a 50 horse-power engine, to be used for electric lighting in Tokio, Japan. They recently shipped one to Bombay, Calaba Causeway, India.

The "C. & C." Motor Company have sent out a new catalogue, showing the forms of their fan motors for 1890. These little machines occupy a space something less than a cubic foot, and will keep a room of ordinary size at a pleasant temperature during the hottest weather.

The Western Electric Company has issued a neat and comprehensive catalogue describing their incandescent system of electric lighting. Handsome cuts of their well-known type of dynamo, switchboards and all appurtenances, embellish the pages. This company is noted for the excellent workmanship of its productions and the ability to manufacture and install every electrical device invented for domestic comfort and safety.

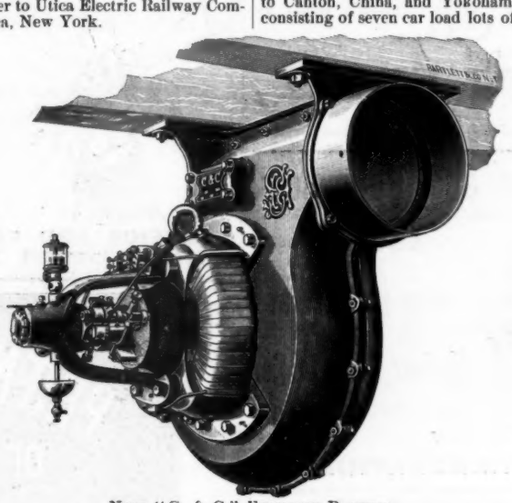
The Burlington Route and its Unsurpassed Service.—The Burlington route is the only railroad running handsomely equipped through trains from Chicago, St. Louis and Peoria, to all principal points Northwest, West and Southwest. This company, since its excellent handling of the large delegation to the Kansas City Convention, between Chicago and Kansas City, has been a popular line with electrical travelers, and it well deserves their patronage. The road is thoroughly well equipped and safely and popularly managed.

The Interior Conduit and Insulation Company, of this city, is in receipt of a letter from Mr. Frank Kitton, the Buffalo insurance inspector, in which the following appears: "I am glad to be able to say I regard your system of wiring as one of the greatest advances made in this direction since electric lighting became a commercial possibility." This company has also taken up the question of underground conduits, and has just sold the underground system for Detroit to the Detroit Electric Light and Power Company.

The John Stephenson Company have just shipped a Sprague exhibition car to Berlin. This car is finished in the finest manner possible, and is equipped with all the latest improvements. Three more first-class cars equipped with Thomson-Houston motors have recently been sent to Georgetown, D. C. The Stephenson Company have every facility for making electric cars, including mounting the motors and wiring. When an electric car leaves their shops it is all ready to be put right into service. Business is very brisk with them and a gratifying increase is noticed in their foreign trade.

Mitis Wrought Iron —This meritorious product is destined to play an important part in the construction of dynamo-electric machinery of the future. Its peculiar properties make it especially adapted for the field pieces of dynamos and motors. A sample, tested February 5, 1890, by an eminent electrician (whose name is withheld by request), gave four per cent. greater capacity of magnetism, and 72 per cent. less residual magnetism, than a bar of ordinary wrought iron previously tested. Prof. Sylvanus P. Thompson, in his celebrated work entitled "Dynamo-Electric Machinery," refers to Mitis wrought iron. This product is being prepared for the market in enormous quantities by the Mitis Wrought Iron Company, of Neponset, Mass.

The National Pipe Bending Company, of New Haven, Conn., manufacturers of the National Feed Water Heater, report a very busy season in their line of heaters and coils, having sold 35 heaters in February and 47 in March, including three to Mexico; one 300 horse-power to Alpha Cotton Mills, North Carolina; one 200 horse-power to Haddenfield Electric Light Company, New Jersey; one 300 horse-power to New York City; one 100 horse-power to Massillon, Ohio; one 300 horse-power to Consolidated Electric Light Company, Great Falls, N. H.; one 600 horse-power to Albany, N. Y.; one 200 horse-power to Westinghouse Electric Company, Bluff Point, N. Y.; one 150 horse-power to Citizens' Electric Light Company, Burlington, Vt.; one 200 horse-power for a Spanish Electric Company; one 200 horse-power to Newport, R. I.; one 150 horse-power to Spanish Electric Light Company, Puerto Principe, Cuba; one 100 horse-power Edison Electric Company, Martinsburgh, W. Va.; one 150 horse-power to New York City; one 150 horse-power to Hyde Park Electric Company, Hyde Park, Mass.; one 200 horse-power to Baltimore, Md.; one 150 horse-power to Electric Light Company, Jamaica, West Indies, and one 500 horse-power to Utica Electric Railway Company, Utica, New York.



NEW "C. & C." ELECTRIC BLOWER.

A New Electric Blower.

Proper ventilation is an important feature on ship board, and as so applied is most carefully studied. The illustration on this page is made from the photograph of one of the new electric blowers placed by Messrs. Cramp & Sons' Ship and Engine Building Company on the U. S. Cruiser "Baltimore." This blower is of the "C. & C." Company's make, is type No. 4 and discharges 1,425 cubic feet of air per minute. Fastened to the ceiling of the dynamo room, it completely changes the air of the room once every two minutes, discharging it at a distant point through a small pipe. The entire machine is so compact that it takes up no space that could be used for anything else and does its work so noiselessly that a person standing near cannot tell without the closest observation whether it is running or not. A letter received at the Bureau of Equipment and Recruiting refers to this blower and the excellent work that it is doing. Captain Schley says: "Concerning the success of the fan and motor supplied for the dynamo room of this vessel, by the 'C. & C.' Electric Motor Company, I have the honor to inform you that it gives perfect satisfaction. We have found that it maintains a most comfortable temperature in the dynamo room, and that there has been no trouble with the starting box, commutator, brushes, nor with any part of the apparatus, after a test extending over the past two months."

The ease with which these blowers can be set up and connected to the dynamos, without requiring any shafting, belting or other contrivance except the small wire, has already brought them to the attention of ship builders, and both the cruisers "Charleston" and "San Francisco," launched on the California coast recently, also the "Philadelphia" from Cramps' Yards, have had the size No. 4 placed in their engine rooms. In placing this machine upon the market, the "C. & C." Company has made possible an improvement in ship ventilation very greatly needed, and forming an important step in the development of the use of electricity for power purposes.

Underground Cables.

In the past three years the Standard Underground Cable Company has twice doubled the capacity of its Pittsburgh factories; first by the extension of the old factory, and second by the building of a new factory adjoining the old and of equal capacity; both these factories have been run day and night for more than a year. The Standard Company have recently bought at Brinton, Pa., near Pittsburgh, extensive grounds and have broken ground for a new factory to cover eight acres. The old and new factories will continue to run for a year or two longer, when all the new factories at Brinton will be completed. When the Brinton factories are in full operation it is believed that they will be the largest wire and cable factories in the world. The necessary arrangements have been perfected with two railroad companies to extend their tracks through the factory grounds for convenience in loading and unloading car load lots.

Among the shipments of this company during the month of March, 1890, were two to Canton, China, and Yokohama, Japan, consisting of seven car load lots of weather-proof and underwriters' wire, incandescent cord, etc.

The New York office of this company, in charge of Mr. Geo. L. Wiley, will be removed, on May 1st, to the *Times* building, where more extensive quarters have been secured.

WARNING TO INVESTORS.

Suit against the UNITED STATES ALUMINUM METAL CO., OF NEW YORK, operating the so-called Herault Process of Electric Smelting, has been begun by the COWLES ELECTRIC SMELTING AND ALUMINUM CO., OF CLEVELAND. The alleged process of Herault is a gross infringement of the Cowles patents, and investors are hereby warned that we shall maintain these claims to the full extent of the law.

EUGENE H. COWLES, President.

Office of Light House Engineer, 3d Dist.,
At Tompkinsville, New York,
April 5, 1890.

PROPOSALS will be received at this office until 12 o'clock M., on Saturday, the 26th day of April, 1890, for furnishing and delivery of a dynamo generator for the Statue of Liberty, New York harbor. Forms of proposal, specifications, and other information sholwng what is required, can be had by applying to this office. The right is reserved to reject any or all bids, and to waive any defects.

D. P. HEAP,
Major of Engineers, U. S. A.,
Light House Engineer.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON APRIL 8, 1890.

424,993 Telephone tool box and connection register; Charles E. McCluer, Richmond, Va.

424,995 Switchboard; Edward A. Owen, East Saginaw, Mich.

424,997 Electric stop-motion for wrapping machine; John E. Prest, Northbridge, Mass.

425,004 Electric alarm device for clocks; Robert Schmitz, Cleveland, Ohio.

425,038 System of telpherage; James E. Maynadier, Taunton, Mass.

425,056 Machine for weaving insulating coverings on electrical conductors; Charles T. Stetson, Hanson, Mass.

425,058 Telephone switch; Ernest P. Warner, Chicago, Ill.

425,061 Lightning arrester; James S. Bishop, Chicago, Ill.

425,066 Balanced pen for autographic telegraphs; Harry Etheridge, Pittsburgh, Pa.

425,068 Voltmeter. 425,069 Ammeter; Madison M. Garver, Newark, N. J.

425,071 Pole for electric wires; Levi R. Greene, Boston, Mass.

425,076 Electrically propelled vehicle. 425,077 Electric railway car; Rudolph M. Hunter, Philadelphia, Pa.

425,078 Electrical annunciator drop; Martin Hynes, Boston, Mass.

425,086 Central office system for autographic telegraphs; James H. Robertson, Rutherford, N. J.

425,101 Support for electric railway conductors; Conrad J. Kilian, Milwaukee, Wis.

425,106 Electric rotary pump; Emory L. Nichols, San Francisco, Cal.

425,107 Device for shielding and protecting wires; Herbert E. Penney, Minneapolis, Minn.

425,125 Electric lighting and advertising system; Arthur Douglass, Danes Inn, County of Middlesex, England.

425,135 Electrode for galvanic batteries; William P. Kookogey, Brooklyn, N. Y.

425,154 Illuminating apparatus; Roughsedge Wallwork and Arthur C. Wells, Manchester, County of Lancaster, England.

425,161 Telephone toll box; Harry L. Cassard, Baltimore, Md.

425,164 Method of electric welding; Charles L. Coffin, Detroit, Mich.

425,269 425,270 Electric meter; Milton E. Thompson, Boston, Mass.

425,335 Process of manufacturing metallic electrodes for batteries; Friedrich Marx, Berlin, Germany.

425,388 Electric railway apparatus; John B. Odell, Chicago, Ill.

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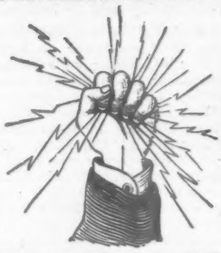

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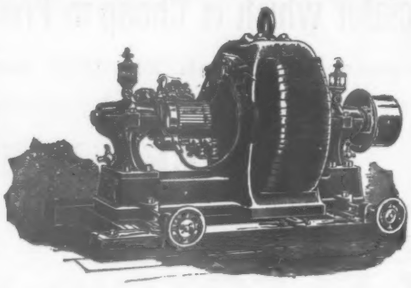

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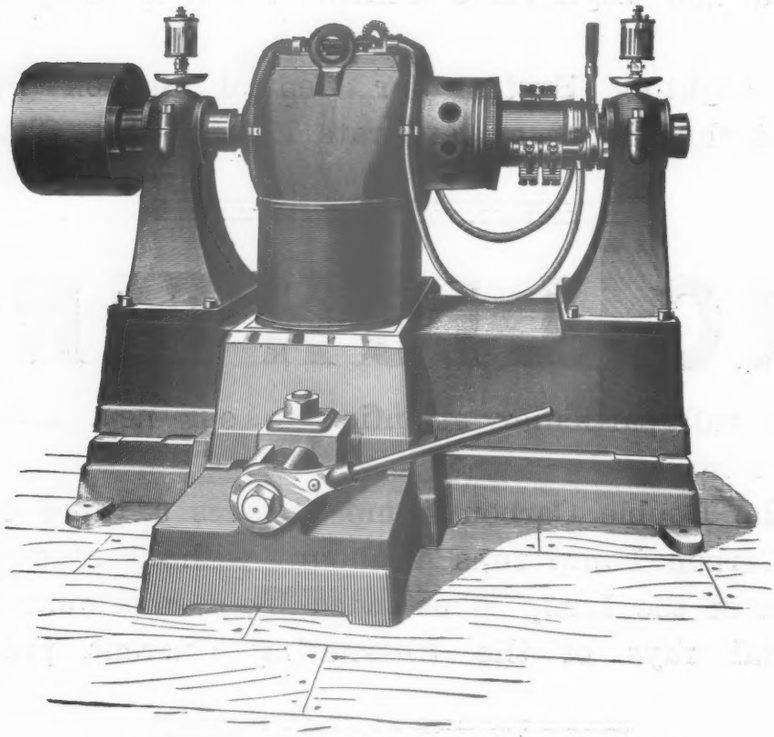

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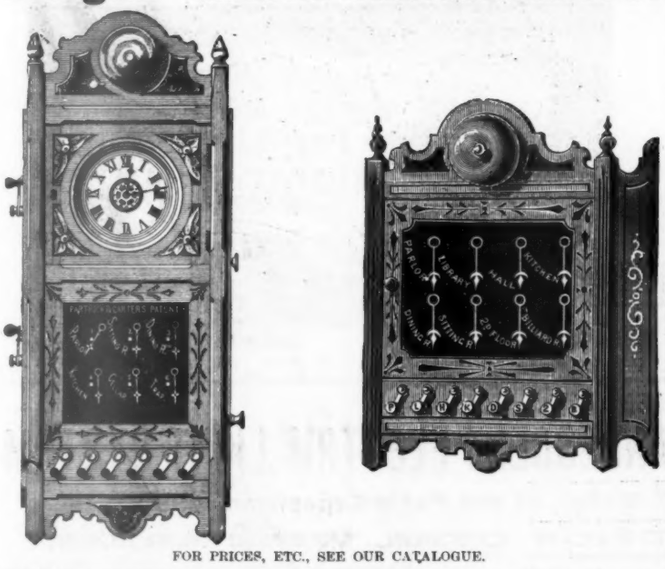

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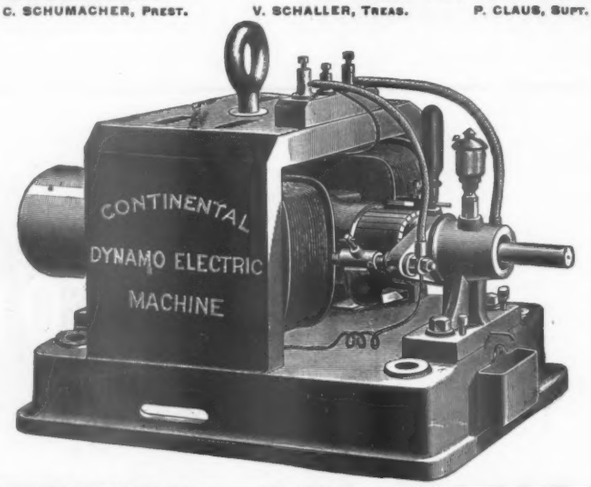

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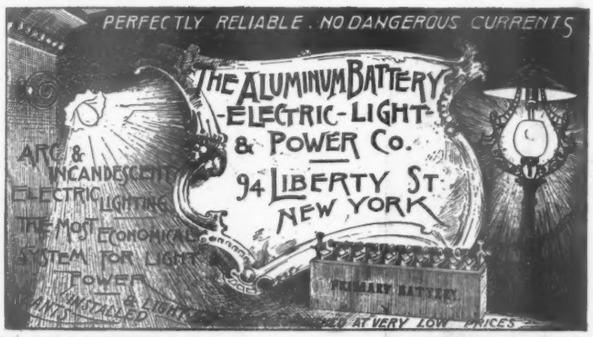

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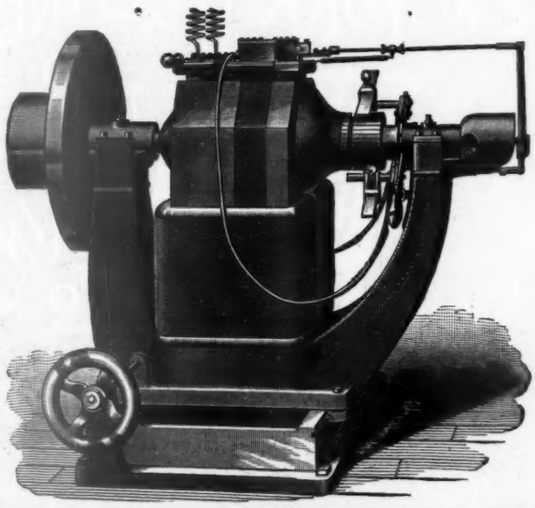

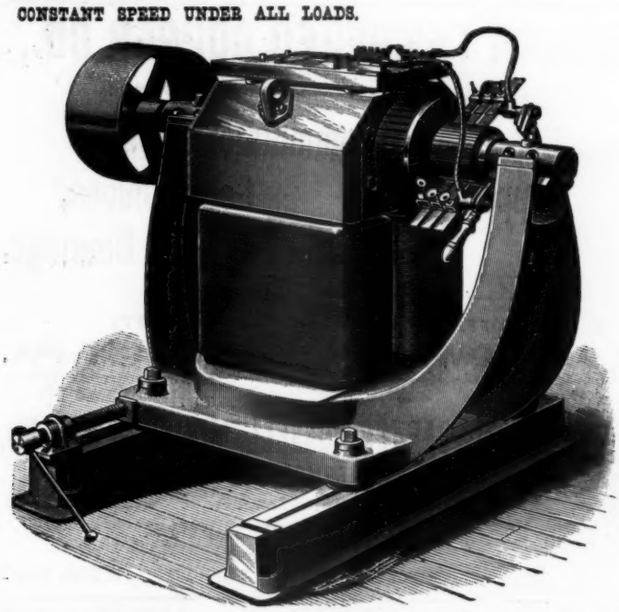

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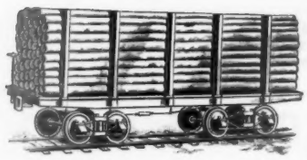

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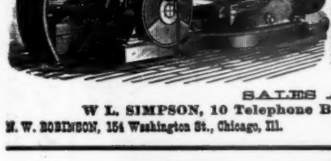

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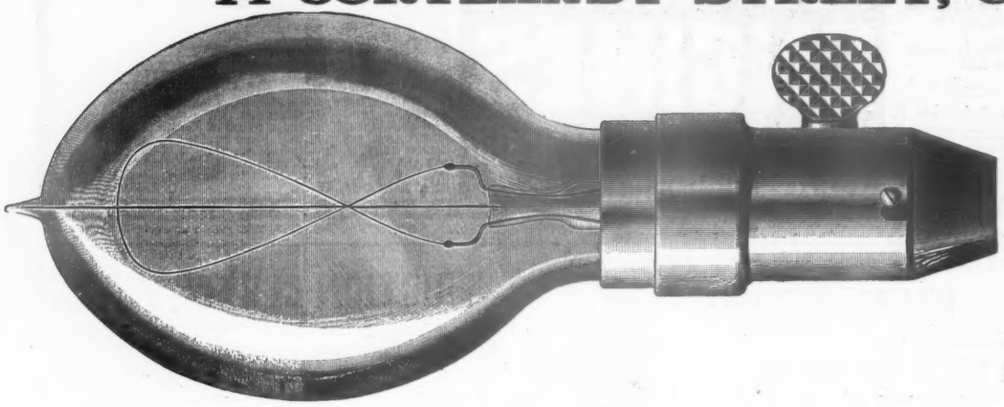

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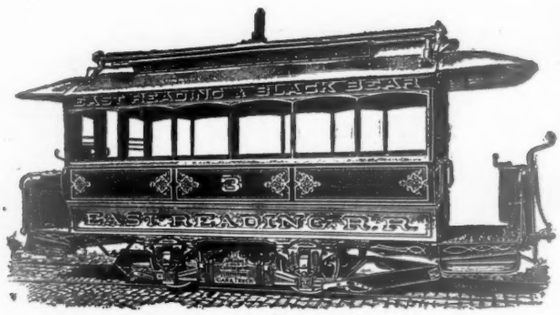

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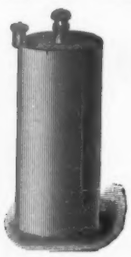

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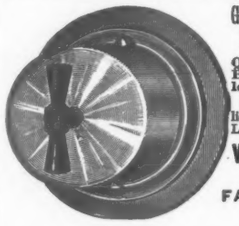

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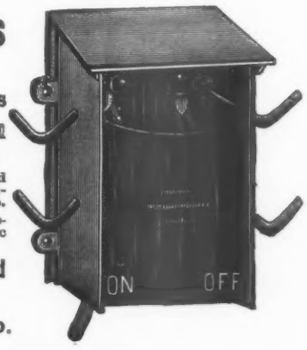

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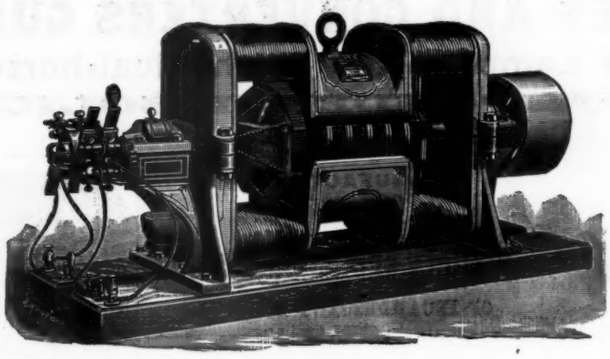

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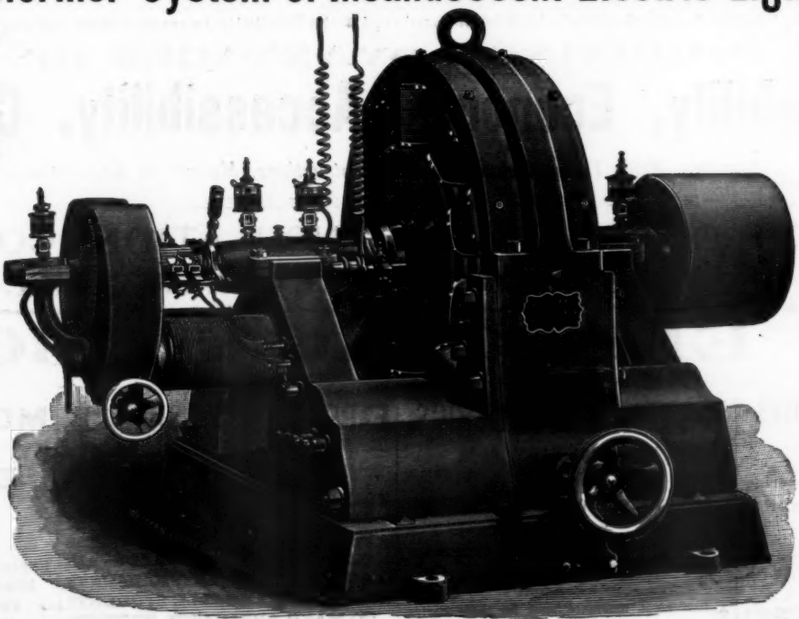

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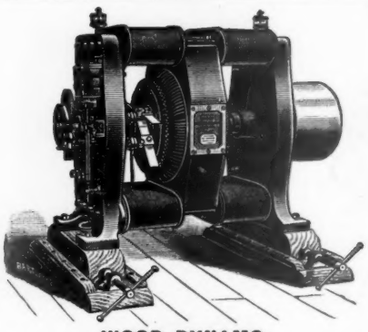

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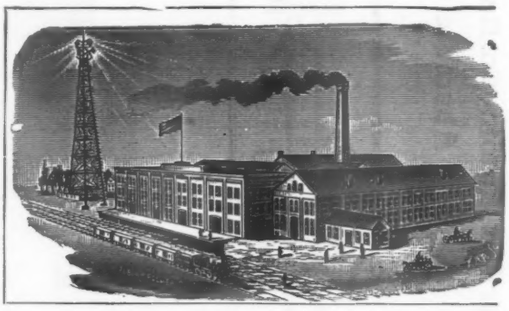

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